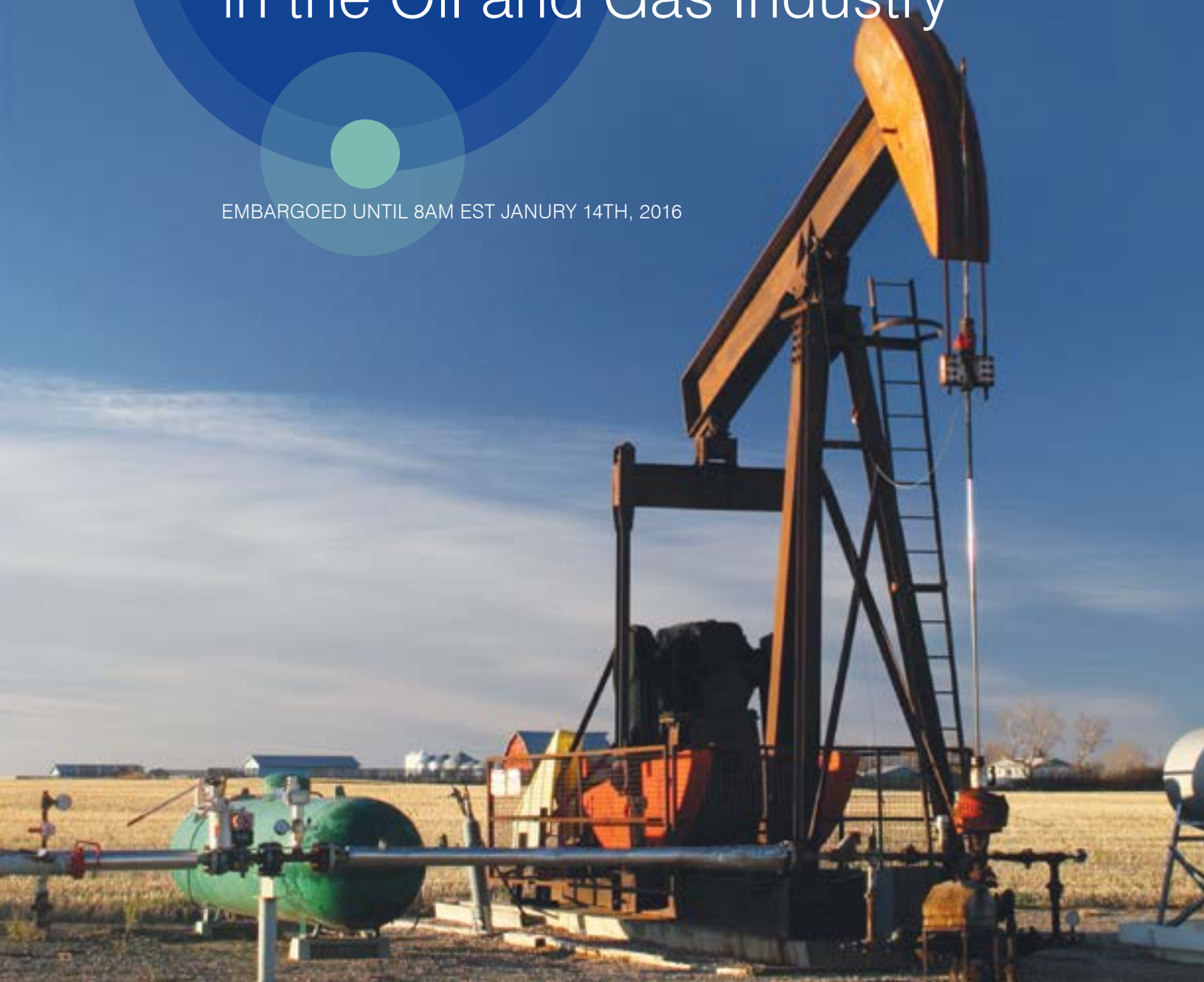


RISING RISK:

Improving Methane Disclosure in the Oil and Gas Industry

EMBARGOED UNTIL 8AM EST JANUARY 14TH, 2016



ABOUT THIS REPORT

This report demonstrates the need for investors to pay greater attention to methane emissions from the oil and gas industry and advocate better disclosure practices on this emerging issue. As scrutiny increases, methane presents short-term risks to investments in the oil and gas industry in the form of economic losses and existing and future regulations. The longer-term prospects for natural gas to play a credible role in the transition to a clean energy global economy are threatened by methane emissions.

It is well documented that there are practical and cost-effective solutions to minimize methane emissions, many of which will increase the bottom line for companies. Our hope is that investors will read this report and take the opportunity to engage constructively with companies to ensure the industry is appropriately handling this issue. Doing so will have the benefits of decreasing risk and improving operational efficiency while making oil and gas companies more sustainable and more valuable.

While the primary audience for this paper is investors, we also provide a number of recommendations for oil and gas operators and disclosure platforms on how they too can improve the state of methane disclosure.

ABOUT ENVIRONMENTAL DEFENSE FUND

Environmental Defense Fund (EDF) is one of the world's largest environmental nonprofit organizations, with more than one million members and a staff of 500 scientists, economists, policy experts, and other professionals around the world. EDF finds practical and lasting solutions to the most serious environmental problems. Working with leading businesses, scientists and academics, EDF is taking a leading role in minimizing the environmental and health risks associated with the development of oil and natural gas.



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thinkPARALLAX designed and produced the final report.

ACKNOWLEDGEMENTS

The authors would like to thank Tom Murray, Ben Ratner, and Sebastian Serra for their significant contributions to this report. The authors would also like to extend their appreciation to the following external reviewers who provided feedback on a draft of this report. Their input does not imply an endorsement of the conclusions or opinions expressed within, which remain exclusively with the authors.

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The authors would like to acknowledge Stephen Donofrio, Founder and Principal of Greenpoint Innovations, for his contributions to this report.

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Foreword

JANUARY 11, 2016

As the nation's largest educator-only public pension fund managing over \$185 billion in assets, the California State Teachers' Retirement System (CalSTRS) is well aware of the substantial risk that climate change poses to the economy, corporate bottom lines and investor portfolios. As a matter of fiduciary duty, we are escalating our attention on this pivotal issue, while working to ensure that the many companies we own are doing the same.

Potent methane emissions from the oil and gas industry pose a burden on the climate and a risk to the industry's reputation, while also representing waste of a valuable product. Therefore, enhanced methane management is both a risk-mitigation imperative and a financial opportunity. Improving methane emission disclosure is a key step toward securing investor confidence, managing risk and unlocking returns.

As a shareholder with a global portfolio, CalSTRS has a financial stake in the long-term performance of the natural gas industry. However, for the gas industry to be part of the solution in the needed transition to a low-carbon global economy, methane emissions — which literally leak away the potential climate benefits of natural gas over other fossil fuels — must be actively managed. Improved methane emission disclosure is one important piece of the climate change risk management puzzle.

Rising Risk: Improving Methane Disclosure in the Oil and Gas Industry is a valuable contribution to the dialogue about climate solutions, offering fresh insights for investors along with a valuable roadmap for improved disclosure. The data-driven analysis in *Rising Risk* underscores the need for improvement in methane emissions disclosure to address reputational risk, regulatory risk and economic waste. CalSTRS believes that the use of a core set of streamlined methane metrics to improve transparency will contribute to improved risk management for the industry. Improving methane management and related disclosure will also help companies maximize operational efficiencies, get ahead of upcoming regulations and do their part to address climate change.

Managing methane emissions is a critical part of the urgent challenge of addressing climate change. In keeping with our fiduciary duty, CalSTRS will encourage oil and gas operators to embrace improved methane emissions disclosure as a win-win opportunity to mitigate risk, build trust and create long-term shareholder value.

Jack Ehnes

Chief Executive Officer

California State Teachers' Retirement System

Executive Summary

Voluntary reporting on methane emissions by the oil and gas industry is poor — less than a third of reviewed companies report emissions and zero companies disclose emissions reduction targets **making it challenging for investors to effectively gauge materiality, assess performance and manage risk.**

Methane, the primary component of natural gas, is a climate pollutant 84 times more powerful than carbon dioxide over a 20 year period, and it is responsible for a quarter of the warming we are experiencing today.¹

Emissions from the oil and natural gas industry represent the largest industrial source of methane emissions, both in the United States and globally.² Methane emissions undermine the value proposition of natural gas for delivering cleaner, low-cost energy, and have drawn increasing scrutiny from the public, environmental and health groups, and state and federal policymakers. Additionally, emissions of methane represent wasted saleable product, with implications for operational efficiency and the bottom line. Unfortunately, reporting of methane emissions by the industry is lacking, making it challenging for investors to effectively understand the materiality of the problem, assess performance and manage risk.

Benefits of Methane Emissions Data

Improved transparency is required to enable investor management of three key risks:

- **Economic:** Emissions of methane, the main component of natural gas, represent a loss of resources that directly impact topline revenue. Estimates suggest that as much as \$30 billion of natural gas is emitted into the atmosphere each year globally, with \$2 billion lost annually in the U.S. alone.³ Low-cost solutions exist to reduce these emissions, many of which come with a positive payback.⁴ Understanding company methane

management practices and results can serve as a proxy for operational efficiency.⁵

- **Regulatory:** Regulators at the state and federal level are beginning to institute standards to limit methane emissions. Methane emissions information can help investors understand a company's exposure and how easily it can comply with regulations as they are implemented.
- **Reputational:** Methane emissions are a long-term reputational risk for the industry. Methane reduces the climate benefits of natural gas and thus undermines its ability to hasten the transition towards a lower-carbon economy. Better data can help investors understand how industry is addressing this issue.

This report has three purposes: (1) to educate oil and gas investors on the importance of methane emissions, (2) examine and document the current state of reporting on methane in the U.S. oil and gas sector and (3) provide recommendations to improve the amount, quality, and accuracy of methane emissions data.

The Current State of Methane Reporting is Inadequate

To understand the current state of reporting, EDF conducted an analysis of 40 of the largest U.S. oil and gas producers, as well as 25 large midstream companies. We reviewed primary sources of information for investors and other stakeholders, including SEC filings, CDP questionnaires, sustainability reports and company websites. The primary findings include:

- **Zero companies disclose reduction targets, and few report methane-related data.** Of the 65 companies, only 18 reported their methane emissions. Even fewer companies provided detailed information on how they are managing their emissions. Zero companies provided quantitative reduction targets, and one company provided comprehensive information regarding their leak detection and repair (LDAR) programs. A positive correlation between size of companies and quality of disclosure suggests the state of disclosure among the smaller companies not within the scope of this report may be even worse.
- **The quality of disclosure is low, limiting usefulness for decision-making.** Among companies that disclose emissions, reports contain vague, qualitative information that is not actionable. The qualitative and highly variable nature of corporate disclosures limits meaningful assessments of, and comparisons between, individual companies. Furthermore, companies measure their emissions in a variety of ways, primarily using estimates, which diminishes the accuracy of data.
- **The lack of rigorous and standardized metrics hampers disclosure quality.** Across the various disclosure platforms, each has a different methodology for how companies should report their methane information. This inconsistency limits the comparability of data.



Recommendations: A New Approach to Reporting Can Improve Transparency

Based on the challenges with current reporting, three areas must be addressed to improve methane disclosure:

METRICS

Investors need rigorous, accurate and comparable information to assess company performance. Unlike in financial reporting, no standardized metrics currently exist for methane emissions. EDF, with input from investors and operators, has developed a set of methane metrics. These metrics will make data more actionable and aid in the assessment of methane performance. We recommend that operators utilize the metrics as performance indicators to drive operational improvements, investors use metrics to assess performance and manage risk, and disclosure platforms incorporate the metrics in their questionnaires and methodologies.

- **Emission Rate** — Emission rate refers to the percentage of total methane volume which is being lost as a function of production or throughput — a single methane intensity figure. By reporting emissions as a percentage, the resulting data becomes comparable between companies, regardless of size, and over time, as a given company's operations evolve.
- **Reduction Targets** — Goal setting is the most basic and effective management device for improving performance. Emission reduction goals and timelines provide actionable information about management commitment to reduce emissions.
- **LDAR Protocol** — Operators should report the frequency, methodology and scope of their leak detection and repair (LDAR) programs. LDAR is one of the most important ways for a company to reduce emissions, so understanding how a company approaches LDAR can help investors gauge how effectively a company is reducing emissions.
- **Economic Value of Methane Emissions** — Expressing methane emissions as a dollar value allows investors to easily understand the potential financial impact of wasted natural gas.

ACCURACY

The accuracy of reported methane data can be improved. Companies often use emission estimates that may be based on outdated information and thus not reflective of actual emissions. Companies should strive to utilize direct measurement of emissions, particularly for fugitive emissions.⁶ In general, companies should ensure that their measurement is comprehensive, based on frequent observation and employs rigorous quantification.

PLATFORMS

While the Environmental Protection Agency's (EPA) Greenhouse Gas Reporting Program (GHGRP), a compliance reporting program, has substantial information on methane emissions for U.S. facilities, there are several limitations to the program that hinder its usefulness for investors. Organizations like CDP, Sustainability Accounting Standards Board (SASB), and Global Reporting Initiative (GRI) have developed to fulfill investors' growing desire

to incorporate environmental, social and governance (ESG) data, such as methane, into their decision-making processes. Operators should utilize these platforms. In turn, the organizations must elevate the methane component of their reporting platforms, and improve it by using key methane metrics to harmonize standards, improve comparability and reduce reporting burden on operators.

While better methane reporting is critical for investors, such improvement should also help operators. The process of measuring and reporting methane emissions will drive increased management attention to this issue, leading to waste reduction, higher revenues and improved positioning to comply with regulations. Furthermore, given the continued public concerns about the environmental impacts of fossil fuel development, improved transparency on methane management can foster constructive dialogue across multiple stakeholders and ultimately build trust for long-term operations.

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Introduction

Why This Report

In the course of Environmental Defense Fund's (EDF) work on methane science and policy, investors have expressed that they are increasingly focused on methane but are having trouble finding data that would enable them to incorporate methane into their decision-making process. The data gap is problematic for two reasons. First, investors have hidden risks in their portfolios, ranging from reputational to regulatory to economic. For oil and gas investors, such risks cannot be eliminated through diversification, only appropriately managed. Second, investors cannot rigorously assess and compare company performance on methane without good information. Furthermore, without methane data, investors cannot engage in data-driven discussions with senior management that would foster greater attention to this issue and possibly prompt a proactive operational response.

EDF systematically analyzed how companies are reporting, in order to understand whether investors are getting the information necessary to assess how a particular company is managing this problem.

This report presents results from an analysis of the current state of corporate reporting of methane emissions and their related risks. The report discusses both the level and quality of reporting. There are various reporting venues for methane emissions and other ESG issues, intended for different audiences such as regulators, investors, customers and executives. For example, while EPA's Greenhouse Gas Reporting Program (GHGRP), a compliance reporting program, has substantial and detailed information on methane emissions for U.S. facilities, there are several limitations to the program which hinder its usefulness for investors.⁷ This paper focuses on high-level, consolidated corporate disclosure with investors as the primary audience.

We reviewed, when available, CDP disclosures, sustainability reports, 10-Ks, and websites for 65 of the largest upstream and midstream companies with significant operations in the U.S. The analysis reviewed publically available data and used the most recent data available, primarily from 2014. The analysis investigated whether companies are reporting methane emissions and other related data, such as reduction targets and emissions reduction practices, that would signal to investors how well methane risks are being addressed operationally.

In addition to the analysis, this report makes recommendations to improve the state of methane reporting, including a set of four methane metrics that, if implemented, would bring a level of standardization and rigor that is currently lacking across the industry.

Why Methane Matters

Methane is one of the most potent greenhouse gases —84 times more powerful than carbon dioxide in the first 20 years after it is released. The U.S. oil and gas sector is the largest industrial source of methane pollution in the US — emitting more than 7 million metric tons of methane emissions each year.⁸ That equates to the short-term climate impact of 160 coal-fired power plants and enough lost natural gas to meet the cooking and heating needs of over 5 million American homes each year.

Data from reports prepared by leading climate scientists from the Intergovernmental Panel on Climate Change (IPCC) suggest that nearly a quarter of the warming we are experiencing today is caused by methane and other short term climate pollutants.⁹ Because of varying timing of impacts for methane and carbon dioxide, reducing both is critical to comprehensively addressing climate change.

Addressing both methane and carbon dioxide is essential to any comprehensive response to climate change.

Along with methane emissions, oil and gas operations also emit other pollutants, including smog-forming volatile organic compounds (VOCs) and cancer-causing pollutants like benzene. Reducing methane emissions will also deliver significant public health benefits by cutting smog and hazardous air pollutants in our communities.

Methane is not just a climate issue or solely a U.S. problem. Because methane is the primary component of natural gas, methane emissions represent the loss of a saleable product. Recent analysis by the Rhodium Group found that in 2012, about 3.5 trillion cubic feet (TCF) of unburned natural gas, worth about \$30 billion, was emitted globally from the oil and gas industry as a result of leaks and vented (i.e. intentional) emissions.¹⁰ That loss is about the amount of gas brought to market in 2012 by Norway, the seventh largest gas producer.

Low-Cost Solutions Are Available

A 2014 report by the consulting firm ICF International found that a 40% reduction in methane emissions by 2018 is achievable using currently available technology and would cost the industry as a whole roughly \$2 billion in upfront capital costs and \$108 million a year in operational expenditures — roughly a penny per thousand cubic feet of gas produced on average, system wide, in the U.S.¹¹ Approximately half of the reductions identified in the report come with a positive pay back for companies, since the value of the saved natural gas more than offsets the costs of the reductions. A similar report looking at Canada's oil and gas industry found even greater potential to reduce methane cost-effectively.¹²

Growing Investor Interest in Methane Emissions

There has been a notable uptick in activity and attention from oil and gas investors on the methane issue in the past few years. From 2014-2016, 15 methane-focused shareholder resolutions were presented to oil and gas companies, including Hess, Kinder Morgan and Occidental, to reduce emissions and provide better disclosure. Additionally, dozens of investors participated in webinars, lunches, and other discussions focused on methane in 2015, hosted by organizations such as Ceres.

In July 2015, a group of investors with \$1.5 trillion in assets under management (AUM), including CalPERS, CalSTRS and BMO Global, signed a letter urging the U.S. government to institute standards to limit methane emissions from the oil and gas industry.¹³ This letter represents over a four-fold growth in interest in terms of AUM compared to a similar investor letter released less than a year prior.¹⁴ In September 2015, over 35 faith-based investors called on oil and gas companies to support the proposed EPA methane rules.¹⁵ These investors acknowledge the long-term threat that methane emissions pose to the industry and the increase in investor confidence that would come through meaningful federal action to put in place rules to limit emissions.

Methane in the Context of ESG Reporting

Investors are increasingly using environmental, social and governance (ESG) data to identify trends and opportunities across industries and ultimately make investment decisions. Incorporating such information can provide investors with a more holistic view of the companies they are analyzing, which not only enables more effective risk management but, as some evidence suggests, can also drive improved returns.¹⁶ Such practices date back to the 1980s,¹⁷ and the number of institutional investors asking for this information has grown over the last decade, with organizations such as the United Nations-supported Principles for Responsible Investment (UNPRI) Initiative,¹⁸ CDP¹⁹ and Ceres building networks of investors interested in incorporating such data. In a sign of the growing acceptance of utilizing such data, in October 2015, the U.S. Department of Labor reversed its prior stance on ESG issues, declaring that it is within an investment manager's fiduciary duty to consider ESG issues in investment decisions.²⁰

Incorporating methane emissions data into investment decisions would fit squarely within the growing trend of considering ESG data alongside traditional financial data.

Need for Transparency



Increasing awareness and scrutiny on methane emissions increases risks for investors, necessitating better data to manage risk and assess performance. Companies would also benefit from increasing transparency.

- **Economic Risk:** Poor disclosure hinders investor understanding of the amount of saleable product being wasted.
- **Regulatory Risk:** Current and future regulations to minimize emissions have potential financial and operational impacts.
- **Reputational Risk:** Methane emissions threaten natural gas' legitimacy in the transition to a cleaner energy economy, potentially jeopardizing "social license to operate," and limiting demand.

Methane emissions present numerous near and long-term risks for investors, the most important of which are discussed in detail below. Investors need sufficient data to properly evaluate these risks and assess company performance.

Economic Risks of Methane Emissions

Methane released into the atmosphere never reaches the market, representing a potential loss of product and revenue, while simultaneously contributing to climate change. Methane emissions from the oil and gas industry represented \$30 billion in wasted resources worldwide in 2012, with roughly \$2 billion in the U.S. alone, which suggests there is a substantial financial opportunity for companies that properly identify and manage their methane emissions.²¹ A 2014 ICF International study shows that cost-effective technologies and practices exist for companies to capture methane, and in certain cases even generate positive returns.²²

Quality reporting and management of critical ESG factors such as methane are considered proxies for a well-run operation.²³ Given that methane is a saleable product, emission rates could be thought of as a measure of operational inefficiency. What gets measured gets managed, which can lead to improved company performance on an issue, mitigating financial risks or providing opportunities. Investors need to understand where and how a company may be operating inefficiently, its implication for the top and bottom line, and how a company is addressing the resulting costs. As a result, companies should be able and willing to measure and report their methane leak rate. Companies that fail to disclose should face additional scrutiny.

Quality reporting and management of critical ESG factors such as methane are **considered proxies for a well-run operation.**



Regulatory Risks of Methane Emissions

As the methane regulatory landscape changes, investors should know how companies are positioned to respond. Companies that have clear data on emissions and disclose efforts and goals for reduction can signal to investors that they are prepared to manage compliance with forthcoming rules.

At the federal level, the EPA proposed methane emissions standards for new and modified oil and gas facilities in August 2015 that are expected to be finalized in mid-2016. Likewise, the Bureau of Land Management (BLM) is soon expected to propose standards to reduce waste of natural gas produced on federal lands. These rules are part of a national strategy, announced by the White House in January 2015, to reduce U.S. methane emissions from the oil and gas sector to 40-45% below 2012 levels by the year 2025. Future regulations will likely address methane emissions from existing sources, which are generally not covered under the draft rules announced in August of 2015. As context, roughly 90% of emissions in 2018 are forecast to come from existing sources.²⁴ As such, these additional rules will be necessary to achieve the nationwide goal of reducing emissions 40-45%.

In addition to recently announced federal rules, state methane regulations already exist in some jurisdictions. In 2014, Colorado became the first state to directly regulate methane from oil and natural gas operations.²⁵ Wyoming requires mandatory leak detection and repair to reduce pollution from oil and gas wells in the Upper Green River Basin area, which has faced deteriorating air quality.²⁶ Ohio has rules that limit air emissions, and California and Pennsylvania are developing methane rules.

Companies that have clear data on emissions, and disclose efforts and goals for reduction, can signal to investors that they are **prepared to manage forthcoming rules.**

Economic risk today includes the lost revenue and potential profit from methane emissions, as well as the broader implications on operational efficiency. It does not take into account the potential societal impacts of these emissions. However, if jurisdictions began attaching a price to methane pollution similar to carbon pricing schemes, the economic impact of these emissions could be far higher. As far as we know, no companies currently have an internal shadow methane price to account for the costs of the externalities of their emissions.

A point often lost in the discussion of economic interests is that the motivations of senior oil and gas company management are not always aligned with the interests of long-term shareholders. Senior management, driven by short-term compensation structures and quarterly reporting demands, may be motivated to cut corners to achieve short-term gain. But that can put a company's long-term economic performance at risk. For institutional investors that are either passive investors and/or take a buy and hold approach, methane emissions management, and the associated reporting around it, presents an important issue where investors may need to engage with management in order to protect their investment in the company. Such engagement will be more productive when investors have useful and rigorous data.

Reputational Risks of Methane

Methane emissions threaten a core plank of natural gas's often touted value proposition – its ability to deliver a cleaner form of traditional energy.

Natural gas emits less carbon dioxide and conventional pollutants than coal when burned. Some investors have invested in natural gas, in part, because they see greater societal adoption of gas for these climate benefit reasons. However, every ton of methane emitted into the atmosphere compounds natural gas's climate footprint and reduces its contribution to a lower-carbon economy. Many people, including investors, who initially supported natural gas as a transition fuel to a lower carbon energy mix, are starting to question its role due to methane emissions.²⁷

Without good data on methane emissions, investors cannot understand if the industry is minimizing emissions in an effort to produce the cleanest product possible, solidify the role of gas, and manage reputational risk.

Every ton of methane emitted into the atmosphere **reduces natural gas' contribution to a lower-carbon economy.**

Operators Benefit from Improved Disclosure

Although this report centers on the benefits that improved methane disclosure provides to investors, the industry itself can benefit by reporting on methane. The International Petroleum Industry Environmental Conservation Association (IPIECA) cites enhanced business value, improved operations, strengthened relationships, and enhanced trust and credibility as the benefits of robust sustainability reporting.²⁸

Build Trust — Without the public's trust in the industry's ability to address environmental and public health concerns, the industry may see community and other stakeholder acceptance diminish, a potential erosion in social license to operate. Conversely, polls reveal that 82% of Americans think that improved transparency on climate change initiatives will increase trust in a company.²⁹

A relevant recent example of improved environmental disclosure in the oil and gas industry is FracFocus.³⁰ Through this program, in response to growing concerns around water contamination, the industry increased disclosure on chemicals used in hydraulic fracturing operations. Industry regards this heightened disclosure as a helpful step toward improving its standing with the public, including neighbors of operations.

As concerns around methane grow, industry has a financial interest in proactively providing better information around a company's methane emissions and efforts to reduce them. In addition to benefits with the general public, a recent analysis by Goldman Sachs shows that social license to operate issues, of which methane is one, must be resolved to unlock capital-intensive downstream investments that capitalize on the surge of natural gas in the North America.³¹

Improve Decision Making — Better disclosure equips management with decision-useful data upon which to act. Improved methane awareness and disclosure will enable management to benchmark against competitors and make informed investments to improve performance and cut product loss.

Get Ahead of Regulations — Companies already taking action on methane can use improved disclosure to demonstrate to investors and downstream stakeholders that they are well positioned to thrive in a methane regulated world.

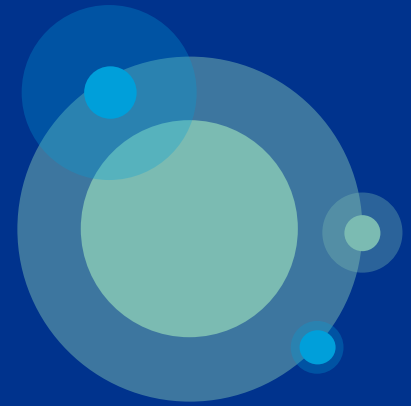
Increase Business Value — On an individual company basis, disclosing emissions and information around company practices can help companies distinguish themselves from their peers to the public and investors. Companies with good performance on material sustainability issues have been shown to outperform companies with poor management of material sustainability issues.³² SASB lists methane as part of its "greenhouse gas (GHG) emissions" disclosure topic that is likely to constitute material information for companies in the oil and gas industry.³³

Disclosing emissions and information around company practices can **help companies distinguish themselves from their peers.**

Current State of Disclosure

EDF analyzed the methane disclosure practices of 65 of the largest U.S. oil and gas companies, and found the overall state of disclosure to be lacking.

- Few companies provide data on methane.
- Poor data quality hinders usefulness for investors.
- There is insufficient standardization of methane reporting methodologies and metrics for methane across reporting platforms.



EDF hired Greenpoint Innovations to analyze the current state of corporate disclosure on the issue of methane emissions in the oil and gas industry. Focusing on companies with operations in the United States, EDF identified a sample of 40 of the largest upstream producer companies³⁴ and 25 large midstream companies.³⁵ A full listing is available in the appendix.³⁶

Through an investor lens, the research team analyzed the publicly-available reporting of these companies on a number of investor-focused disclosure platforms to determine if they are providing a sufficient level of methane data for investors to incorporate related risks into their decision-making process.³⁷ In doing so, we reviewed companies' websites, sustainability reports^{38,39}, CDP disclosures, annual reports and SEC filings.⁴⁰ The bulk of the analysis was conducted in July and August 2015.

The primary goal of this research was to analyze the state of disclosure broadly in terms of what and how much data is being reported and whether or not the data is actionable. A secondary objective was to understand which reporting mediums were most utilized by companies to report on methane emissions and related content.

The analysis focuses on key areas of interest to investors, including the reporting of methane emissions data, the implementation of methane reduction targets, management policies and operational programs to reduce emissions such as leak detection and repair, and management views on methane regulations.

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Key Insights and Takeaways:

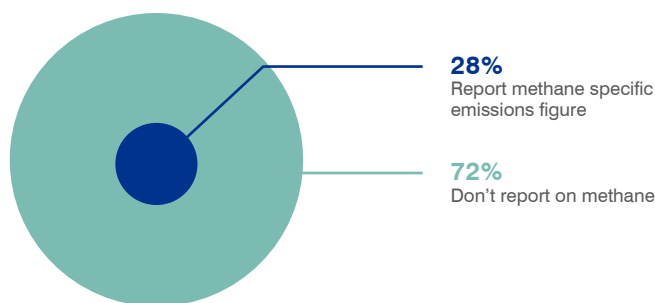
- **Zero companies disclose reduction targets, and few report methane-related data** — The majority of companies are not reporting any methane-related data, and disclosing companies are providing few details about their emissions or efforts to reduce them. No company discloses a quantitative target for reducing emissions.
- **The quality of disclosure is low, limiting usefulness for decision-making** — Reported information tends to be qualitative, vague and non-standardized, which hinders its usefulness and comparability.
- **The lack of rigorous and standardized metrics hampers disclosure quality** — The level and quality of data lacks consistency across platforms, as there are no standardized metrics and methodologies concerning methane.

Zero companies disclose reduction targets, and few report methane-related data.

- Zero companies report a quantitative, time-bound methane emissions reduction target.
- 28% of companies report methane emissions.
- 49% of companies report on their leak detection and repair (LDAR) programs.
- 8% of companies report their methane emissions policy position.

Methane Emissions — Less than a third of the companies (28%) reported their methane emissions as a methane-specific figure (i.e., not as part of a total GHG CO₂e figure). An additional 23% included their methane emissions in overall Scope 1 GHG emissions, with no breakout of distinguishable methane-specific data, or referred to an external source (e.g., EPA, The Climate Registry, Wyoming Department of Environmental Quality, etc.).⁴¹ Finally, 51% didn't report methane emissions at all. Because of the disparate impacts of methane versus carbon dioxide over time, and the fact that methane is both a pollutant and an economic product, breaking out these emissions separately is critical for data to be actionable for investors.

Reporting of Methane Emissions

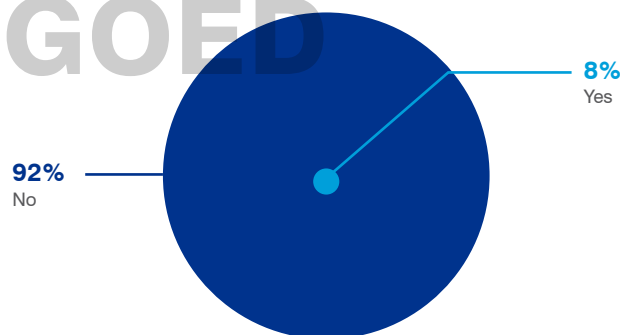


Reduction Targets — None of the 65 companies reported time-bound quantitative targets to reduce methane emissions from their operations. Targets are important for driving performance and creating a basis of accountability.⁴² Targets help investors understand a company's long-term plans concerning methane, and their absence creates uncertainty over whether the issue is being appropriately managed.

Methane Reduction Operational Practices — 49% of companies reported conducting some form of leak detection and repair (LDAR). LDAR is the process by which companies locate and then repair leaks of methane, and is one of the most effective ways for a company to manage and reduce its emissions. As such, understanding how comprehensively a company conducts LDAR practices can help signify how well companies are addressing methane.

Methane Policy Position — Five of the 65 companies (8%) disclose their positions on policies to reduce emissions, or highlight their work with policymakers in crafting effective regulation. Corporate leadership on environment today requires engaging constructively on policy solutions. Disclosing a company's view on the role of regulations

Report Policy Positions



In its 2014 sustainability report, Anadarko discussed methane rules in Colorado and stated a commitment to “working with governmental agencies and other stakeholders in developing sound public policy that promotes appropriate and effective regulations, recognizing that oil and natural gas are essential to modern life and critical to the success of our economy.”

to address environmental issues like methane is a data point investors should consider as they are assessing how a company is managing methane and managing relationships with regulators that set rules in which businesses must operate. For example, Anadarko, Noble and Encana represented the industry in working with the Colorado state government, EDF and other key stakeholders to establish methane and volatile organic compound regulation in existing infrastructure, offering valuable data, input and leadership. Select companies hold dialogue with federal regulators, but corporate disclosure of the goals and nature of those dialogues is sparse.

The quality of disclosure is low, limiting usefulness for decision-making,

- 14% of companies report their methane emissions as a rate (e.g., emissions over production or throughput), a more effective way to assess and compare a company's emissions.
- 45% of companies report a qualitative ambition concerning methane emissions reductions, where they acknowledge the need for reductions, but provide no data around the amount of reductions sought or the timeline involved.
- Less than 2% of companies reported sufficient data to provide comprehensive insight of their LDAR programs.

In its sustainability report, Marathon Oil reports a methane emissions rate of 0.3%. This **allows investors to compare past and future figures against this benchmark,** tracking progress. It is also a useful figure when comparing Marathon to other companies.

Methane Emissions — While 28% of companies report their methane emissions, only 18% reported emissions as a rate, which is calculated by comparing a company's methane emissions to its production or throughput volumes. An emissions rate is a more effective way to assess a company's emissions than by absolute volume, as investors are better able to compare company performance despite differences in overall production level, and are better able to track progress over time.

Southwestern Energy is "Using FLIR cameras to survey facilities on a frequency of at least once per year, take direct measurements and identify fugitive emissions containing VOCs and methane and repair leaks as soon as practical. The LDAR program is being implemented across all of our operated areas within the company."

Qualitative reduction statements — While 35% of companies recognize in some way the desire to limit emissions, all of them do so through the use of vague, overly-qualitative terms. These qualitative statements do not include a quantitative reduction goal or a timeline to achieve it. Vague language limits the ability of investors to track progress, compare performance amongst companies and hold management accountable. Vague aspirations suggest an unstructured approach to the issue and could imply a lack of management attention to driving results.

Leak Detection and Repair — While 49% of companies mention conducting some form of LDAR, companies are not disclosing enough quantitative detail for investors to understand how comprehensive their LDAR program is in practice. There is minimal detail describing the methodology, geographic scope (percentage of assets covered) and frequency. Twenty-three companies provide some indication of geographic scope, and 18 companies provide information on the frequency of inspections. Only Southwestern Energy provided enough detail to reasonably convey the extent of its LDAR practices, stating the methodology, scope and frequency.

Examples of vague, unspecific language that makes up the entirety of a company’s LDAR protocol description include, “our facilities are inspected regularly, using industry-standard leak-detection methods,” and “monitoring wells are installed to watch for leaks.” Further, while some companies provided information on assets covered by LDAR (e.g. regions, individual facilities, business segments, etc.), only Southwestern provides a percentage of assets to provide a sense of overall scope.

The lack of rigorous and standardized metrics hampers disclosure quality.

- No standardized methane metrics exist, making comparisons within and between platforms difficult.
- 22% of companies disclose methane-related data in annual reports or mandatory SEC filings.
- Companies report on methane to a variety of voluntary platforms.
- Quality of reporting varies by platform, with websites providing the least usefulness.

When analyzing the reporting practices of companies across disclosure platforms, we found that a significant amount of companies are utilizing these platforms and reporting on ESG issues. Almost 40% provide a CDP questionnaire and nearly half produce a sustainability report. Since all of the companies analyzed were public, all have 10-Ks and websites. 94% of companies were reporting some ESG related information on their websites.

Of the voluntary platforms, 96% of companies have either a website, CDP response or sustainability report.

Furthermore, 22% of companies report relevant methane information in their 10-Ks or 20-F filings. Annual filings with the United States Securities and Exchange Commission (SEC) are mandatory for companies listed on U.S. exchanges. Our analysis suggests that the SEC issued Interpretative Guidance from 2010 regarding company disclosure around climate change risks is not being adequately addressed in the context of methane.⁴⁶

Although a notable number of companies are conducting some form of sustainability reporting, disclosure of quality information on methane remains limited. This disconnect suggests that reporting platforms need to improve their methodologies, ensuring that the most relevant questions are being asked and that the requests are aligned across platforms. One significant factor contributing to the poor quality of methane data is the lack of rigorous, relevant and comparable methane metrics for investors.

Corporate websites are the most ubiquitous example of methane reporting devoid of standardized guidance or methodology. After reviewing disclosure practices related to methane across a number of different platforms, we found that reporting was the least accessible on corporate websites. It was time-consuming to find methane data on websites, as there is no standard placement from site to site. This is likely due to the lack of clear guidance or methodology regarding how companies should use their websites for ESG information. Given this, and the fact that established methodologies and platforms exist elsewhere, EDF’s view is that leading disclosure practices should not include putting such information solely on the pages of companies’ websites.

	CDP ⁴³	Sustainability Report	Website ⁴⁴	One of the Three
Publish	37%	45%	94%	92%
Include Relevant Methane Information⁴⁵	29%	37%	40%	63%

Secondary Findings

Large Companies Lead and Smaller Companies Lag, on Sustainability Reporting

While it is worth noting that this review only looked into 65 of the largest companies, we found a distinct difference in the level of transparency and quality of reporting between the largest and smallest companies, with larger companies in general providing more and better quality methane data. In an industry with thousands of companies smaller than the 65 within the scope of this analysis, the correlation between company size and quality of disclosure suggests that the overall state of methane disclosure for the industry beyond these 65 relatively large companies is very weak.

EDF recognizes the limited sample size of small-cap companies, but believes our findings are generally consistent with other studies in showing that large companies tend to perform better around ESG disclosure. The 2014 CDP disclosure results provided in the CDP S&P 500 Climate Change Report 2014 states that companies “that rank in the top quartile versus industry group peers are more than 66% more valuable at \$62.5 billion average market capitalization versus the S&P 500 average of \$37.6 billion.”⁴⁷

U.S. Headquartered Companies Lag Behind Their Foreign Counterparts

As the focus of our analysis was on the largest producers and mid-stream oil and gas companies with operations in the U.S., the majority of companies featured in this study are based in the U.S. (58 of 65). Therefore, the resulting sample size may skew the results. However, our analysis did show that in general non-US oil and gas companies disclose on methane better than their U.S. peers. This pattern fits with the overall trend for sustainability reporting across all industries that other studies have found.⁴⁸

All seven of the companies headquartered outside of the United States disclosed to CDP, compared to 27% of U.S.-headquartered companies.⁴⁹ 57% of the non-U.S. companies completed the supplementary CDP oil and gas sector module while only 20% of U.S. companies did the same. Further, all companies not headquartered in the United States produced sustainability reports and reported sustainability information on their websites, while 34% of U.S. companies produced a sustainability report, and 31% reported relevant information on their websites.

	Disclose to CDP	Disclose to CDP OG Sector Supplement	Produce Sustainability Report	Post Sustainability Information on Websites
Large Cap	60%	43%	63%	51%
Mid Cap	11%	4%	26%	30%
Small Cap	0%	0%	0%	0%



Why Are Companies Not Disclosing More?

The primary purpose of this analysis was to understand the current state of methane disclosure within the oil and gas industry. It was not within the scope of this analysis to document or analyze the factors driving disclosure practices within the industry, or lack thereof. However, we did interview a number of operators and investors following our analysis to hear their perspectives about why the current state of disclosure is so limited. While a number of reasons were cited as possible causes, the three below were the most often mentioned:

- Limited Bandwidth to Address Growing Reporting Requests** — As noted earlier in this paper, many companies cite “reporting fatigue” as a growing issue, with multiple organizations requesting data. Companies cited the lack of coordination among reporting organizations in terms of the format of data reported which adds to the delay. Given time and capital constraints, companies may not prioritize reporting on ESG issues like methane.
- Lack of Pressure** — A number of investors suggested that companies were not getting enough pressure from stakeholders about providing data on methane. Without adequate pressure, management may calculate that the short-term costs of disclosure outweigh the potential benefits.
- Compliance Reporting is Enough** — Companies cited the fact that they report some methane emissions data to the EPA as part of the Greenhouse Gas Reporting Program as alleviating the need to report on methane more broadly to investors.

Other reasons given for the lack of reporting were the relatively new focus from investors and reporting platforms on industry-specific issues such as methane, whereas in the past ESG reporting was focused on broader issues like water or supply chain risk. Some companies did not see the value in reporting. They suggested that too much credit is given for disclosure instead of operational practices that actually drive environmental improvements. Lastly, one company offered that many production company executives do not recognize climate change as real, and therefore feel no need to report methane emissions or other environmental data.

Metrics — Making Methane Data More Useful

The lack of standardized methane metrics limits data usability. A standardized set of quantitative and rigorous metrics will better enable investors to assess and compare company performance over time and manage risk.

EDF proposes the following four metrics for adoption by platforms and companies:

- **Methane emission rate** — the volume of methane emissions expressed as a percentage of gas production or throughput.
- **Methane emission reduction targets** — the amount and timeline of intended emissions reductions.
- **LDAR protocol** — the methodology, scope and frequency of a company's LDAR program allows investors to ensure that best practices are being utilized.
- **Economic value of methane emissions** — the economic value of a company's lost methane.

The oil and gas industry as a whole is doing a poor job disclosing meaningful information on methane emissions. While one part of the problem is simply the limited number of companies disclosing data, the other major issue is the quality of existing disclosures. A key deficiency is that reporting is overly reliant on qualitative information and boilerplate language, with not nearly enough company-specific quantitative data. These issues hinder users from comparing company performance over time and across companies.

Investors need rigorous, accurate and comparable information to properly assess and rank the performance of companies. Investors accomplish this in large part by looking at financial metrics such as earnings per share (EPS), year over year (Y/Y) sales growth and profit margins, which serve as proxies to

understand how well management is running a company. No such methane metrics currently exist for methane emissions. The Economist Intelligence Unit, in a report on the financial risks to investors from climate change, acknowledged this issue, stating:

*“Accurate information is important for all companies, but particularly vital for fossil-fuel businesses and large energy consumers...Unfortunately, **there is no standardized set of metrics or indicators for the disclosure of climate change-related information**...The fact that information on carbon emissions and climate risks is not readily available in a comparable form **limits the ability of institutional investors to manage the risks within their own portfolios effectively.**”⁵⁰ (Emphasis added by EDF)*

With the goal of making data more rigorous, comparable and actionable, we have selected four methane metrics that we strongly encourage companies and reporting frameworks to adopt and begin reporting. While no small set of metrics can provide users with a complete picture, these metrics will give helpful information on how companies are handling the methane issue from a business and operational perspective. These metrics were selected with input from investors and operators, aiming to provide data on the most critical elements related to methane release, methane emissions rate, LDAR, target setting and economic waste.⁵¹ The methodologies for calculating and presenting these metrics can be found in the appendix.

Methane Emissions Rates

Description — The amount of methane emitted by a company represented as an intensity factor. In this case, as a percentage of either production or throughput, depending on which segment of the supply-chain a company is operating in.

Why It's Important — The latest scientific studies on methane emissions from the natural gas and oil industries suggest that, in order to maximize the climate benefits of a transition from both diesel and coal to natural gas on all time scales, methane emissions from the industry must be limited to an emissions rate of 0.8%.⁵² This means that each individual segment throughout the natural gas value chain, from well site to burner tip, must contribute much less than 0.8%. A study by the University of Texas found that the average rate associated with natural gas extraction is 0.42%.

An emissions rate provides a way to track individual company performance over time. Investors can quickly track emissions performance regardless of changes in production and assets.

Benefits — By framing emissions as a rate, the data becomes much more useful for fostering comparisons in two important ways. First, users can compare emissions performance across companies, regardless of company size, production volumes and geographic footprint of operations. Such comparisons would be difficult, if not impossible, to make with absolute emissions.

Second, an emissions rate provides a way to track individual company performance over time. Investors can quickly track emissions performance regardless of changes in production and assets.

Reduction Targets

Description — Targets for methane emission reductions and progress made against previous goals along pre-set timelines. For example, a production company with a starting methane emissions rate of 0.4% of gross production could choose a target of reducing emissions by 25% to reach a 0.3% rate over 3 years.⁵³

Why It's Important — Investors regularly receive guidance from companies about future financial and operational performance. This information is important to indicate the prospects for the company, but also to signal to investors that management is properly focused on important issues and fostering a culture of continuous improvement. For these same reasons, target setting should extend to sustainability issues like methane emissions. A lack of a reduction target could indicate that a company is not focusing on reducing product loss.

Benefits — Companies that proactively take emission reduction targets and implement best practices will be better positioned to thrive in a methane-regulated world. Investors could also engage with management on progress in achieving targets, discussing successes and failures and implementing necessary changes. As goals are set and benchmarked against others in the industry, progress can be accurately measured.

Several companies in the industry, including ONEOK and Shell, have already proactively taken the step of establishing targets to reduce flaring of excess gas. This is valuable and should be extended from flaring to methane emissions, which is a much larger contributor to warming in the next two decades. ONE Future, led by Southwestern

Energy, has already started to do this through a voluntary methane emissions program in which companies set targets to bring system-wide emissions to less than 1% of production. While voluntary programs are not a substitute for regulatory safeguards, they can help participating companies demonstrate reduction potential, accelerate progress and receive recognition.

In its 2014 sustainability report, Shell set a specific target with a timeline for flaring reduction, stating they plan “to end continuous flaring by 2030.” Companies, by reporting specific goals with timelines for methane emission reduction, can **aid investors in assessing the future performance of companies, and their commitment to the methane issue.**

Leak Detection and Repair Protocol

Description — The frequency, methodology, and scope (percentage of assets covered) of a company’s leak detection and repair program (LDAR). LDAR is the process of locating and repairing methane leaks, otherwise known as fugitive emissions, which may occur throughout the oil and gas value chain and arise from operator errors and equipment failures. Frequency refers to how often a company observes its assets for leaks (e.g. monthly, quarterly, annually). Methodology is the process (e.g.

optimal gas imaging (OGI) cameras, handheld sniffers, etc.) that the company uses to detect methane leaks, while scope is the percentage of the company’s assets that are inspected under an LDAR program. According to the EPA, an LDAR program using OGI cameras quarterly can reduce methane and VOC emissions by 80%, compared to 60% semi-annually and 40% annually.⁵⁴

Why It’s Important — Fugitive emissions are one of the biggest sources of methane emissions throughout the supply chain. A finding from the Barnett Coordinated Campaign methane measurement science study shows that at any given time roughly 15% of production sites that were inspected were functional “super-emitters,” responsible for 75% of the total methane emissions measured from those sites.⁵⁵ A small number of sources were responsible for the majority of emissions.

Higher emissions from these sites are often a result of avoidable operating conditions such as equipment leaks and tank venting that are relatively easy to fix with frequent monitoring and repair practices.⁵⁶

Finding and fixing leaks is a key component to any methane reduction program. An ICF study found that LDAR is the single biggest opportunity for methane emission reductions, with over a third of the reduction opportunities identified in the study coming from quarterly LDAR.⁵⁷

An ICF study found that **LDAR is the single biggest opportunity for methane emission reductions**, with over a third of the reduction opportunities identified in the study coming from quarterly LDAR.

Benefits — Understanding how a company is implementing LDAR can be a good proxy of how seriously it is addressing methane emissions in its operations. The following three elements of a company's LDAR program will shape how effective it is at finding and fixing leaks to reduce emissions:

- **Frequency of Inspections** — The more often equipment is checked for leaks, the quicker leaks will be found and the more reductions a company can expect to achieve. Generally, monthly or quarterly inspections are considered best in class.
- **Methodology** — The employed methodology can also affect reductions. For example, LDAR using OGI camera technology that enables users to see otherwise invisible emissions will get more reductions than inspections done by olfactory, visual and audio (OVA) inspections alone, in which field personnel look and listen for leaks.

- **Coverage** — The coverage of a company's LDAR program will drive the level of potential reductions. The more assets covered, the more opportunities for emissions reductions.

Economic Value of Emissions

Description — The dollar value of methane emissions.

Why It's important — Methane is not just a pollutant, but also a product, since it is the primary constituent of natural gas. Estimates suggest that as much as \$30 billion of methane is lost each year globally, with \$2 billion wasted annually in the U.S. alone. This simple data point will quickly allow investors to understand the effects of annual methane emissions on a company's top line, particularly for upstream companies.

Benefits — This metric will enable investors to understand how efficiently a company is managing one of its main products and engage in a data-driven discussion around the economics of reducing emissions.

EMBARGOED

Accuracy — Improving Methane Emissions Data

Compliance reporting of methane emissions provides a good foundation for a company's emissions inventory, but requires certain modifications in order to improve the data for investors. Three guiding principles should be followed to help bridge the gap and improve the overall accuracy of emissions data:

- Measurement should be comprehensive, including all significant sources of emissions.
- Companies should employ frequent observation of operations as they gather data. This is particularly true of fugitive emissions sources, which by nature are difficult to predict in terms of timing and size of leaks.
- Companies should use rigorous quantification where possible, including greater utilization of direct measurement instead of emissions estimates.

Actual emissions from individual facilities in the transmission and storage segments were **260% higher than the emissions reported in Subpart W.**

Companies build inventories of methane emissions using a combination of direct measurement and estimates. For companies operating in the U.S., the EPA's Greenhouse Gas Reporting Program related to oil and gas systems, referred to as Subpart W, provides requirements on measurement methodologies. Unfortunately, Subpart W requirements have some limitations that could be addressed to strengthen the accuracy of data.

As outlined in the following table, the Subpart W program is not comprehensive in two ways: 1) only U.S. facilities of a certain size report emissions and 2) certain segments of the natural gas value chain are excluded from the program, as are some significant and known sources of emissions. In addition, the data relies on estimates of emissions rather than requiring direct measurement, resulting in potential failure to account for large fugitive leaks known as "super-emitters."

For example, a study published in *Environmental Science and Technology* found that actual emissions from individual facilities in the transmission and storage segments were 260% higher than the emissions reported in Subpart W, as the program excludes monitoring in certain operating modes and of certain devices, such as reciprocating compressors in stand-by mode.⁵⁸

Companies should address these limitations when creating a more complete and accurate data set for investors who will want to understand a company’s entire emissions, not just those from U.S. assets or facilities of a certain size.



Subpart W

Investor-focused ESG Platforms

	Subpart W	Investor-focused ESG Platforms
Primary Audience	Regulators, scientists	Investors
Secondary Audiences	Oil and gas customers	Oil and gas customers, the public, regulators
Scope — Sources	<ul style="list-style-type: none"> Excludes facilities emitting below 25,000 metric tons / year CO₂e Excludes certain emission sources such as onshore production blowdowns, reciprocating compressor rod packing vents in non-operating mode, and centrifugal compressor dry seal vents 	<ul style="list-style-type: none"> Includes all facilities regardless of size Includes all emission sources
Scope — Geography	U.S. operations only	Global operations
Primary Reporting Focus	Facility-level emissions	Company-level emissions
Measurement Methodology	<ul style="list-style-type: none"> Set by EPA Primarily estimates emissions and activity factors with limited direct measurement 	<ul style="list-style-type: none"> Flexible Opportunity for operators to do more direct measurement Opportunity to update emissions estimates with latest data from methane measurement studies



Finally, we offer recommendations that companies can follow to improve the accuracy of their emissions, building on the measurements required for Subpart W:

- **Comprehensive** — Measurement should include all significant sources of emissions. There are a number of emission excluded sources under Subpart W that should be included:
 - Onshore production blowdowns,
 - Reciprocating compressor rod packing vents in non-operating mode,
 - Centrifugal compressor dry seal vents and
 - Processing sector tanks.
- **Frequent Observation** — Because fugitive emissions are random by nature, and thus hard to predict in terms of timing and magnitude, companies should employ frequent (e.g., monthly or quarterly) observation of their assets in order to more accurately gauge the size of their fugitive emissions.
- **Rigorous Quantification** — While estimates of emissions and activity factors may be fairly accurate for certain sources, direct measurement can improve accuracy of emission for the following:
 - Fugitive Emissions — Currently, companies only need to use estimates for known leaks of methane, despite wide ranges of emission sizes. There is no requirement to quantify fugitive leaks. Companies should use robust detection and direct measurement of fugitive emissions sources in order to provide for a more accurate emissions database. Estimates do not capture the presence of

Subpart W measurement guidance **should evolve to better meet the needs of investors** and others for accurate and company-wide emissions data.

super-emitters, the small percentage of sites that are responsible for large percentage of emissions.

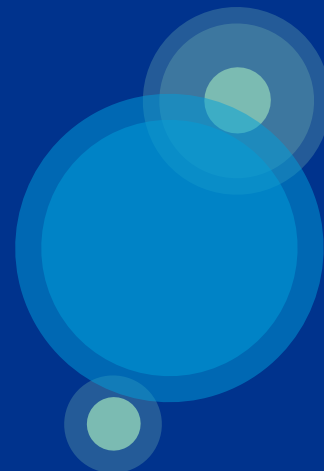
- Compressor Emissions — In the gathering and boosting segment, operators are allowed to estimate emissions from compressors, despite this being a significant source of emissions.

Additionally, best practice would suggest companies have their emissions figures audited, raising both the accuracy of the data and the level of trust from users. Platforms like CDP encourage verification through their scoring methodology.⁵⁹

Subpart W measurement guidance should evolve to better meet the needs of investors and others for accurate and company-wide emissions data, thus negating the need for companies to utilize different measurement methodologies for different audiences. Such alignment between more compliance-focused reporting via Subpart W and investor-focused reporting via the platforms discussed in this paper will reduce the reporting burdens on companies.

Platforms — Reporting to the Right Places

There are a number of leading reporting organizations focused on improving corporate ESG disclosure. Some within the oil and gas industry already follow their guidance, and it is not EDF's intention to compete with or duplicate their work. However, organizations that adopt standardized metrics would increase the quality and rigor of the methane component of their platforms.



EMBARGOED

Recognizing the leading work of many existing disclosure platforms, and the dangers of “reporting fatigue,” it is not EDF's intention to duplicate the work of organizations already striving to put good, useful data into the hands of investors. Instead, EDF would like to highlight these organizations, identify how they can improve methane disclosure and encourage companies to use these platforms to disclose their methane emissions.

CDP

CDP is an international non-governmental organization (NGO) with the mission of providing a platform for companies to disclose climate and natural resource-related information for customers, shareholders and governments to access. Companies from over 80 countries disclose annual reports to CDP, making it “the largest and most comprehensive collection globally of primary corporate climate change, water and forest risk information.”⁶⁰ CDP investor initiatives — backed in 2015 by more than 822 institutional investors representing an over US\$95 trillion in assets — give investors access to a global source of year-on-year information that supports long-term objective analysis.

CDP's questionnaires touch on how a company's operations interact with climate, water, forests and cities. Thousands of global companies are asked, for example, to report on topics ranging from water use and supply chain traceability

to CO₂ emissions. CDP also has sector supplements for some industries, including oil and gas. The oil and gas sector supplement has a number of methane specific questions related to emissions sources and activities to reduce emissions.

EDF engaged with CDP to streamline the methane subsection of the oil and gas questionnaire to feature the metrics proposed in this report, as well as information on the accuracy of emissions data. CDP has adopted EDF's recommendations and will be incorporating them into their 2016 questionnaire.

SASB

The Sustainability Accounting Standards Board (SASB) issues standards for companies to integrate non-financial, ESG data into their mandatory annual filings to the SEC. SASB creates these standards through the lens of materiality, focusing their work on only the most financially-relevant environmental, social and governance issues for each industry.⁶¹ Through their accounting standards, SASB seeks standardized accounting metrics that represent sustainability topics that are likely to constitute material information, ensuring alignment of reporting methodologies across public companies that adopt these standards.⁶²

SASB identified GHG emissions, including methane, as a disclosure topic for oil and gas companies, due to its

economic impact and stakeholder interest. In 2014, SASB released its provisional accounting standards for industries in the non-renewable resources sector. In standards for the oil and gas exploration and production industry, SASB wrote that “the management of highly potent methane emissions from oil and gas [extraction and processing] systems has emerged as a *major operational, reputational and regulatory risk for companies*.”⁶³

For producers and midstream companies, SASB recommends quantitative reporting of consolidated GHG emissions in carbon dioxide equivalent metric tons, as well as percentage breakouts by individual hydrocarbon resource types (i.e. including conventional and unconventional oil and gas) and operational source (i.e. flaring, fugitive emissions). SASB metrics also incorporate the reporting of emissions reduction targets and reporting program against those targets.

“The management of highly potent methane emissions from oil and gas E&P systems has emerged as a major operational, reputational and regulatory risk for companies” — SASB

EDF encourages SASB to add a methane emissions rate to their standards. Additionally, SASB should also request companies to report emissions of methane separately from other GHGs, for both reporting of GHG absolute emissions and for emissions reductions target setting.

SASB recognizes the importance of companies reporting their strategy for managing and reducing Scope 1 emissions including methane, which they highlight in their Oil & Gas Exploration & Production Sustainability Accounting Standard.⁶⁴ Because it is the biggest opportunity to reduce methane emissions, SASB should encourage companies to discuss their use of LDAR in the context of reducing methane emissions (as distinct from other Scope 1 emissions) utilizing EDF’s LDAR metric so that companies do so in a way that enables investors and others to gauge the effectiveness of their LDAR practices.

In 2016, SASB will be doing a review of their provisional standards in deep consultation with industry players, including oil and gas, and will take our recommendations under review for potential incorporation.

GRI

GRI is an international organization that helps businesses, governments and other organizations understand and communicate the impact of business on critical sustainability issues such as climate change, human rights, corruption and many others.

GRI provides a widely-used standard on sustainability reporting and disclosure. GRI’s most recent Sustainability Reporting Standard, the G4, was released in 2013. GRI produced Oil and Gas Sector Disclosures that defines a set of standards specifically tailored for the industry. This reporting guidance was created through consultation of a working group composed of companies, investors, NGOs and research organizations in the industry. It covers a range of topics including GHG emissions, renewable energy research, risk assessment, impact on communities and emergency preparedness.

GRI’s current G4 Standard asks for general information on GHG emissions, rates and targets. However, the Standard does this in carbon dioxide equivalent units and does not offer a specific calculation methodology, allowing companies to calculate these figures as they choose. EDF has engaged with GRI to update their framework to include emissions rates, LDAR and economic value, as defined in the Metrics section of this report, in the oil and gas supplement moving forward. We have also engaged with GRI on disclosure of accuracy of data. Finally, we have encouraged GRI to use the 20-year and 100-year global warming potential (GWP) when calculating emissions in carbon dioxide-equivalent units.

In 2016, GRI will be doing an extensive public review of their Standards and seek recommendations from interested parties for potential incorporation of new contents.⁶⁵

IPIECA

The International Petroleum Industry Environmental Conservation Association (IPIECA) is an international oil and gas industry association for environmental and social issues. With members accounting for over 60% of the world’s oil and gas production, IPIECA focuses on a range

of issues, including a commitment to improving the state of sustainability reporting within the industry. Similar to GRI, IPIECA publishes a framework for sustainability reports, specifically tailored to the industry, identifying key indicators for companies to address when preparing annual reports. The most recent guidance was published in September 2015.

Included in the guidance's environmental, social and governance indicators is a section with recommendations for the reporting of emissions. IPIECA calls for the reporting of direct methane emissions, either in terms of CO₂ equivalent or metric tons, and also suggests companies report emission intensities for all combined GHGs.

The guidance would benefit from changes to its indicators, insisting on the reporting of methane emissions separate from carbon dioxide. Similarly, IPIECA should request that companies report a stand-alone methane emissions rate. In addition, a call for the disclosure of emissions reductions targets, LDAR protocol, and economic value of emissions would improve sustainability reports.

SEC Disclosure

The SEC stands apart from the above mentioned organizations in that it focuses primarily on financial reporting that is required for publically listed companies. Even so, the SEC can help get better ESG data in the hands of investors through their reporting rules. While voluntary reporting is valuable to investors, mandatory reporting is also critical given the relative focus investors give to reviewing 10-K filings as opposed to voluntary reports.

In 2010, the SEC issued interpretative guidance on climate disclosure describing how companies should report in their 10-Ks on the material risks presented by climate change to their assets.⁶⁶ The response to the SEC's guidance has been poor, with very few companies complying with the terms of the guidance. According to a report by Ceres, 41% of S&P 500 companies did not disclose climate related information in their 2013 10-K filings.⁶⁷ Those that did report something did so in a brief manner, using qualitative language that does not assist investors trying to analyze material issues. These findings are consistent with the analysis we have presented in this report.

While SEC's interpretative guidance covers all climate change risks and is thus much broader than just methane emissions, companies should report their methane

While voluntary reporting is valuable to investors, **mandatory reporting is also critical** given the relative focus investors give to reviewing 10-K filings as opposed to voluntary reports

emissions as part of the discussion regarding what, if any, risk they may face from coming federal and state regulations. Incorporating the metrics we identified in their 10-K filings will help make these disclosures more actionable for investors. SASB's standards for reporting material environmental information can help companies effectively put critical information into their SEC filings.

Sustainability Reporting Evaluations and Performance Rankings

There are several groups that rank companies based on their disclosure around ESG issues. While these organizations are not reporting platforms, they play an important role in driving greater disclosure by shining a spotlight on disclosure practices and incentivizing companies to improve via ranking systems.

THE INVESTOR ENVIRONMENTAL HEALTH NETWORK

The Investor Environmental Health Network (IEHN) is a group of investment managers that have partnered with NGOs to drive companies to increase their environmental responsibility through dialogue and shareholder resolutions. IEHN is focused on improving disclosure by oil and natural gas companies, specifically around hydraulic fracturing. In 2015, IEHN released its updated "Disclosing the Facts" report, featuring a ranking of 30 companies and their practices concerning fracking risk disclosure.⁶⁸

The report examines disclosure practices around toxic chemicals, water and waste management, community impacts and air emissions, including methane. Companies are ranked on a point system, receiving one point for each question they report against. Overall, IEHN's analysis

yielded similar conclusions to our analysis, stating “too few companies are providing quantitative disclosures and far too many companies are leaving investors in the dark on far too many issues.”

In past reports, when concerning methane, IEHN looked at disclosure practices touching upon methane leakage rates and some aspects of LDAR programs. More recently, IEHN strengthened the questions in the 2015 edition of its report to incorporate an intensity rate covering all methane emissions (both fugitive and vented), while also looking for disclosure around all three parts of our LDAR metric: frequency, methodology and coverage. IEHN has also added a question around whether companies report a methane emissions reduction target. Moving forward, oil and gas companies are now publically scored on how well they report against these metrics.

Additional Organizations Focused on Rankings and Evaluations

Groups like Bloomberg, Dow Jones and MSCI have developed reports and ratings of companies based on ESG issues. For example, Bloomberg provides four disclosure scores on companies for environmental, social, governance and overall ESG transparency based on the percentage of Bloomberg ESG data points found in public disclosure. MSCI produces a Global Climate Index, identifying the 100 companies that lead in addressing the conditions that contribute to climate change. Similarly, the Dow Jones Sustainability Index (DJSI) evaluates the world’s largest 2,500 publicly traded companies on relevant sustainability criteria.

When measuring the ESG performance of oil and gas companies, rating groups should ensure that methane is incorporated into their analyses. An oil and gas company’s climate and environmental efforts cannot be accurately rated without a consideration of this issue.

Voluntary Industry Initiatives

While the following initiatives are not reporting platforms focused on providing ESG data for investors, they may provide some information on methane that is complimentary to the platforms mentioned previously. Overall, participation in these voluntary industry initiatives should be seen by investors as a commitment by companies to understand and reduce their emissions.

One Future Initiative

Members of ONE Future, an industry initiative including five of the companies analyzed in this report (Apache, BHP Billiton, Hess, Kinder Morgan and Southwestern Energy), are focused on improving methane management across the entire natural gas value chain. One Future’s stated goal is to reduce methane emissions across the entire value chain to less than 1% of total natural gas gross production.⁶⁹ Each segment of the value chain (e.g. production, transmission) will have its own emissions intensity target that each company within that segment must reach.⁷⁰

The initiative asks companies to disclose individual emissions not only as a rate but also as emission intensity targets. Thus, One Future companies will have already committed to reporting on at least two of the EDF recommended methane metrics by 2017. This initiative is a positive step toward industry adoption of quantitative methane emissions reduction targets and improved reporting. One Future has been incorporated into the Environmental Protection Agency’s “Methane Challenge” Program.

The measuring and reporting component of One Future will be more comprehensive than what companies provide in compliance reporting through Subpart W. Member companies, through the One Future reporting mechanism, will measure and disclose emissions for all sources by following standardized protocols.

Participation in these voluntary industry initiatives should be seen by investors as a **commitment by companies to understand and reduce their emissions**

Oil and Gas Methane Partnership (OGMP)

While the OGMP is not a company-wide reporting initiative, investors may find some value in the information disclosed through participating companies' effort to reduce their emissions.

The Partnership, created through consultation with industry, creates a global platform for companies to more fully understand and systematically manage their methane emissions. Recognizing the importance of reducing these emissions, seven companies (BG Group, ENI, PEMEX, PTT, Total, Statoil and Southwestern), key governments (France, UK and U.S.), and civil society (EDF) launched the OGMP in September 2014. The OGMP is designed to provide an international venue for participating companies to report on emissions from nine core sources thought to be the biggest sources of methane emissions. First, partner companies decide which of their operations to include in the reporting

and then establish the viability of control options for emissions sources. Then, the companies implement those controls deemed to be feasible.

The Partnership was designed as a mechanism for interested companies not only to minimize emissions, but also to credibly show their leadership for doing so. As a result, the Partnership will enable companies to efficiently disclose information in order to recognize and demonstrate progress of individual companies.

While yet to be finalized, the level of reporting detail likely to come from OGMP will be important in developing better global data on oil and gas methane emissions. The highly source-specific detail may be a good complement to the investor-focused reporting platforms discussed above, which tend to focus more on consolidated, company-wide emissions.

EMBARGOED

Conclusion

There is a stark but addressable disconnect between the outsized importance of methane as a climate and reputational risk and the scant disclosure it receives in today's corporate reporting practices. With public pressure rising on fossil fuel companies generally, and investor demands increasing for better climate risk disclosure, the time is ripe to improve methane disclosure on the path toward comprehensively addressing the issue. EDF recommends the following:

Metrics

The adoption of the following methane metrics as a centerpiece for methane reporting for relevant stakeholders:

- 1. Methane emissions rate**
- 2. Methane reduction target**
- 3. LDAR protocol(s)**
- 4. Economic value of emissions**

These metrics support quantitative, decision-useful information that stakeholders can utilize to compare companies against each other, as well as assess a single company's progress over time.

Accuracy

Companies should continually seek to improve the accuracy of emissions data, and incorporate a robust direct measurement program. Measurements should be comprehensive, frequently observed and rigorously quantified.

Platforms

Platforms should work to raise the prominence and quality of methane data in their disclosure methodologies. Adopting the recommended metrics will help accomplish this, while helping to streamline methane reporting thereby lessening the burden on operators.

Methane disclosure will only improve if all stakeholders engage on this issue. Investors should ask companies for further disclosure and then must use the available data in their investment process and discussions with management. Operators should utilize the investor-focused platforms discussed in this report, given the current data limitations of compliance reporting. Finally, disclosure platforms should streamline methane reporting using the proposed metrics in order to make data more actionable for investors while reducing reporting fatigue for operators.

Appendix

Recommendations and Resources for Investors

Investors, as owners of oil and gas companies, are uniquely positioned to improve the current state of methane disclosure. To do so, EDF recommends investors take the following actions:

- **Ask management for better data** – One reason companies may not be disclosing more on methane is due to lack of pressure from investors. Ask companies to provide more and better information to enable you to better assess performance and manage risk. Note that Subpart W reporting is not sufficient.
- **Work with disclosure platforms** – Investors need to provide their expertise and voice to ensure organizations such as CDP, GRI, SASB and IPIECA are guiding companies to disclose relevant and useful data on methane. By urging disclosure platforms to adopt our metrics, you can help achieve this goal.

Lastly, it is important for investors to not only ask for information, but also to use this data in both investment decisions and data-driven dialogue with company management. To help with the latter, the following is a list of questions that investors should consider asking of management.

OPERATIONS

- What is the scope, frequency, and methodology of your LDAR activities? What have you learned from LDAR activities currently underway and what is your plan to drive further reductions?
- If you have no methane targets, when will you set them? If you do, what are the barriers to achieving them and how will you overcome them?
- What is the value of your lost methane, and how do you plan on capturing that value and bringing it to the bottom line?
- How are you planning to meet anticipated federal standards to limit methane emissions?

MANAGEMENT

- What incentives are in place to motivate in-field personnel (corporate staff and contractors), senior management and other key internal stakeholders to reduce methane emissions?
- What training programs do you have in place for in-field personnel to prevent error-driven methane leaks?
- Who is the most senior executive responsible for your company's methane mitigation strategy?

POLICY AND STRATEGY

- Have you considered utilizing an internal shadow price on methane to better drive management attention and capital to reduction projects, similar to what some companies are already doing with internal carbon pricing?
- Is the company constructively participating in shaping cost-effective regulations of methane at the state or federal level in the US (or, if relevant, other countries of operation)?
- What factors were considered when determining your company's strategy to reduce emissions?

Metric Methodologies

Emission Rates: Companies should calculate their emissions rate in two slightly different ways: (1) a standard emission rate with methane emissions as a percent of total methane produced, and (2) an energy delivery efficiency rate with methane emissions as a percent of energy production.

Both of these calculations allow investors to properly account for differences in the composition of production between companies. For example, a company that produces primarily oil might have a very high standard emission rate since their emissions at the well site (the numerator) could be comparable to gas-focused companies but the amount of gas they produce (the denominator) is relatively small. In these cases, the energy delivery efficiency rate will more accurately reflect the company's emissions performance.

The standard emission rate is calculated by dividing methane emissions by methane production (for upstream operators) or throughput (for midstream companies). Companies should use average methane composition to determine methane production.

The energy delivery efficiency rate is calculated by dividing methane emissions by energy production or throughput expressed in thousand cubic feet by converting oil to gas using the U.S. Geological Survey conversion of 6,000 cubic feet per barrel of oil.

Companies should provide all inputs (e.g., absolute emissions and production/throughput) that go into the calculations of both rates. Absolute emissions should be disclosed in units of methane. If units are converted to CO₂ equivalence, both the GWP over 100 and 20 years should be used.

Reduction Targets: Companies have discretion in selecting specific targets that will work in the context of their culture and philosophy for environmental target setting. Companies can set targets based on either or both absolute emissions and emissions intensity. Either way, strong targets are quantitative, motivational, time-bound and transparent.

Leak Detection and Repair Protocol: Frequency and methodology do not require any calculations. Calculating coverage will vary depending on whether a company is a

midstream or upstream company. For upstream companies, we define coverage as percentage of well sites covered by LDAR. For midstream companies, coverage is defined in two separate ways: (1) percent of pipeline miles covered by LDAR; and (2) percent of facilities surveyed as defined by the EPA. Both of these numbers should be reported for midstream companies. If a company inspects assets with various frequency rates (e.g., quarterly in Colorado, annually in California), then it should seek to provide a breakdown by frequency, and the percentage of assets covered under each frequency bucket.

Economic Value of Emissions: Reporting Scope 1 methane emission figures for producers in terms of economic value can be done by multiplying the average sale price of gas (expressed as \$/Mcf) by the total Mcf of gas production for the year. For midstream assets, a similar calculation can be done by multiplying the average natural gas price for the reporting year (\$/Mcf), taken from sources such as Henry Hub, by the total throughput of natural gas.

Summary of Company Data

The following is a high-level summary of the company-specific findings regarding methane disclosure practices. A more detailed dataset can be found on EDF's landing page for this report.

Company	Size	Report Methane Emissions as a Rate	Report Methane Emissions as a Standalone Figure	Report a Quantitative Standalone Figure	Report Position on Methane-Related Policy	Discuss LDAR Use
Anadarko	Large	✓	✗	✗	✓	✓
Antero Resources	Large	✗	✗	✗	✗	✗
Apache	Large	✓	✓	✗	✗	✓
BHP Billiton	Large	✗	✓	✗	✗	✓
Boardwalk Pipeline Partners	Medium	✗	✗	✗	✗	✗
BP	Large	✗	✓	✗	✗	✓
Buckeye Partners	Large	✗	✗	✗	✗	✓

Company	Size	Report Methane Emissions as a Rate	Report Methane Emissions as a Standalone Figure	Report a Quantitative Standalone Figure	Report Position on Methane-Related Policy	Discuss LDAR Use
Cabot Oil & Gas	Large	✗	✗	✗	✗	✓
Chesapeake Energy	Medium	✗	✗	✗	✗	✓
Chevron	Large	✓	✓	✗	✗	✗
Cimarex Energy	Large	✗	✗	✗	✗	✗
Conoco Phillips	Large	✓	✓	✗	✗	✓
Consol Energy	Medium	✓	✓	✗	✗	✓
Continental Resources	Large	✗	✗	✗	✗	✗
Crestwood Equity Partners	Medium	✗	✗	✗	✗	✗
DCP Midstream Partners	Medium	✗	✗	✗	✗	✗
Devon Energy	Large	✗	✓	✗	✓	✗
Dominion Midstream Partners	Medium	✗	✗	✗	✗	✓
Enable Midstream Partners	Medium	✗	✗	✗	✗	✗
Enbridge	Large	✗	✓	✗	✗	✗
Encana	Large	✓	✗	✗	✗	✗
Energen	Medium	✗	✗	✗	✗	✗
Energy Transfer Partners	Large	✗	✗	✗	✗	✗
Enlink Midstream Partners	Medium	✗	✗	✗	✗	✓
Enterprise Products Partners	Large	✗	✗	✗	✗	✗
EOG Resources	Large	✓	✗	✗	✓	✓
EP Energy LLC	Medium	✗	✗	✗	✗	✗
EQT Midstream Partners	Medium	✗	✗	✗	✗	✗
EQT Resources	Large	✓	✗	✗	✗	✗

Company	Size	Report Methane Emissions as a Rate	Report Methane Emissions as a Standalone Figure	Report a Quantitative Standalone Figure	Report Position on Methane-Related Policy	Discuss LDAR Use
Exco Resources	Small	✗	✗	✗	✗	✗
Exxon Mobil	Large	✓	✗	✗	✗	✓
Freeport-McMoRan Inc.	Large	✗	✓	✗	✗	✗
Hess Corp	Large	✗	✓	✗	✗	✗
Kinder Morgan	Large	✗	✗	✗	✗	✗
Linn Energy	Medium	✗	✗	✗	✗	✓
Magellan Midstream Partners	Large	✗	✗	✗	✗	✓
Marathon Oil	Large	✓	✓	✗	✗	✓
MarkWest Energy Partners	Large	✗	✗	✗	✗	✗
Newfield Exploration	Medium	✗	✗	✗	✗	✗
NiSource	Large	✗	✓	✗	✓	✓
Noble Energy, Inc.	Large	✗	✓	✗	✓	✓
Nu Star Energy	Medium	✗	✗	✗	✗	✗
Occidental	Large	✗	✓	✗	✗	✓
ONEOK	Medium	✗	✗	✗	✗	✓
Pioneer Natural Resources	Large	✗	✗	✗	✗	✗
Plains All American Pipeline	Large	✗	✗	✗	✗	✓
QEP Resources	Medium	✗	✗	✗	✗	✗
Range Resources	Medium	✓	✓	✗	✗	✓
Rice Energy	Medium	✗	✗	✗	✗	✗
Royal Dutch Shell plc	Large	✗	✓	✗	✗	✓

Company	Size	Report Methane Emissions as a Rate	Report Methane Emissions as a Standalone Figure	Report a Quantitative Standalone Figure	Report Position on Methane-Related Policy	Discuss LDAR Use
SandRidge Energy	Small	✗	✗	✗	✗	✗
Seneca Resources (National Fuel)	Medium	✗	✗	✗	✗	✓
SM Energy Company	Medium	✗	✗	✗	✗	✗
Southwestern Energy Co	Medium	✗	✗	✗	✗	✓
Spectra Energy	Large	✗	✓	✗	✗	✓
Tallgrass Energy	Medium	✗	✗	✗	✗	✗
Targa Resources	Medium	✗	✗	✗	✗	✗
TC Pipelines	Medium	✗	✗	✗	✗	✗
The Williams Companies	Large	✗	✗	✗	✗	✓
Total S.A.	Large	✗	✓	✗	✗	✓
TransCanada	Large	✗	✗	✗	✗	✓
Ultra Petroleum	Medium	✗	✗	✗	✗	✓
Unit Corporation	Medium	✗	✗	✗	✗	✗
Western Gas Partners	Medium	✗	✗	✗	✗	✗
WPX Energy Inc.	Medium	✗	✗	✗	✗	✗

Resources

Reporting and Disclosure Resources

CDP

CDP, formerly Carbon Disclosure Project, is an international, not-for-profit organization providing the only global system for companies and cities to measure, disclose, manage and share vital environmental information. CDP works with market forces, including 822 institutional investors with assets of US\$95 trillion, to motivate companies to disclose their impacts on the environment and natural resources and take action to reduce them.

www.cdp.net

CDP INVESTOR ENGAGEMENT TOOL

Find out how to engage with company management that do not respond to CDP information requests.

www.cdp.net/Docs/investor/investor-engagement-tool.pdf

CERES

Ceres is a non-profit organization advocating for sustainability leadership, mobilizing a network of investors, companies and public interest groups to accelerate and expand the adoption of sustainable business practices and economic solutions.

www.ceres.org/files/methane-emissions

Also refer to Ceres' report, done in partnership with BlackRock, about strategies for investor engagement around ESG issues: www.blackrock.com/corporate/en-us/literature/publication/blk-ceres-engagementguide2015.pdf

GLOBAL REPORTING INITIATIVE (GRI)

GRI is an international independent organization that helps businesses, governments and other organizations understand and communicate the impact of business on critical sustainability issues such as climate change, human rights, corruption and many others. GRI provides widely

used standards on sustainability reporting and disclosure, enabling businesses, governments, civil society and citizens to make better decisions based on information that matters.

www.globalreporting.org

IPIECA

IPIECA is the global oil and gas industry association for environmental and social issues. IPIECA produces industry reporting guidelines for voluntary sustainability reporting.

www.ipieca.org

OIL AND GAS METHANE PARTNERSHIP

The Climate and Clean Air Coalition (CCAC) has created a voluntary initiative to reduce methane emissions in the oil and gas sector: the CCAC Oil & Gas Methane Partnership. The CCAC officially launched the Partnership with founding companies at the UN Secretary General's Climate Summit in New York on September 23, 2014. The founding companies are: BG-Group, Eni, Pemex, PTT, Southwestern Energy, Total and Statoil.

www.unep.org/ccac/Initiatives/CCACOilGasInitiative/CCACOilGasMethanePartnership/tabid/794017/Default.aspx

THE SUSTAINABILITY ACCOUNTING STANDARDS BOARD (SASB)

The Sustainability Accounting Standards Board (SASB) is a non-profit that develops and disseminates sustainability accounting standards that help public corporations disclose material, decision-useful information to investors. Their standards are developed through a process that includes evidence-based research and broad, balanced stakeholder participation

www.sasb.org

Also refer to SASB's Non-Renewable Resources standards:

www.sasb.org/sectors/non-renewable-resources/

Background Information on Methane Science and Economics

EDF

For those interested in further information concerning the science behind methane emissions, EDF provides the following resources:

Methane background: www.edf.org/methane-other-important-greenhouse-gas

Measurement science studies on methane leakage: www.edf.org/energy/methaneleakage

ICF INTERNATIONAL

A management, technology and policy consulting firm that focuses on a number of markets, including oil and gas. ICF has completed a series of studies looking at the economics of methane emission reductions from the oil and gas sector in the U.S., Canada and Mexico.

U.S. Study: www.edf.org/energy/icf-methane-cost-curve-report

U.S. Federal and Tribal Lands Study: www.edf.org/energy/study-finds-substantial-loss-natural-gas-us-federal-and-tribal-lands

Canada Study: www.edf.org/climate/icf-report-canadas-oil-and-gas-methane-reduction-opportunity

Mexico Study: www.edf.org/energy/icf-report-mexicos-oil-and-gas-methane-reduction-opportunity

RHODIUM GROUP

Rhodium Group (RHG) combines policy experience, quantitative economic tools and on-the-ground research to analyze disruptive global trends. RHG supports the investment management, strategic planning and policy needs of clients in the financial, corporate, non-profit and government sectors. RHG produced a study, commissioned by EDF, looking at global methane emissions from the oil and gas industry.

www.rhg.com/reports/untapped-potential

Endnotes

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33. SASB lists GHG emissions as a sustainability disclosure topic likely to constitute material information for public companies in the US, following the US Supreme Court definition of materiality. The accounting standard related to this topic covers methane emissions.
34. Also known as exploration and production companies, these companies focus on searching for oil and gas and bringing it to the surface through the drilling of wells.
35. Mostly pipeline companies, this sector focuses on the transportation, storage, and wholesale marketing of oil and gas
36. Of the 65 companies researched , 35 were large cap (greater than \$10 billion market capitalization), 27 were mid cap (\$2 - \$10 billion market capitalization) and three were small cap (\$300 million - \$2 billion in market capitalization). Market capital size is accurate as of May 2015. Stock market values may have shifted since then.
37. For the purposes of this report, we consider "investor focused disclosure platforms" as annual reports, SEC filings, CDP disclosures, company websites and sustainability reports
38. Sustainability Reports as a category includes, but not limited to, company produced reports with a variety of titles, including "Corporate Sustainability", "Corporate Social Responsibility", "Corporate Responsibility" and "Corporate Citizenship"
39. The majority of sustainability reports are dated 2014 (19 of 29), six were 2013, 2 are 2013-2014 and two were 2015
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44. Although all 65 companies publish a website, 6% do not contain any sustainability-related content, and thus are not considered here as "publishing through this sustainability reporting medium."es, this sector focuses on the transportation, storage, and wholesale marketing of oil and gas
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