



METHANE DISCLOSURE IN THE OIL & GAS INDUSTRY

TRACKING THE IMPACT OF
SHAREHOLDER ENGAGEMENT



INTERFAITH
CENTER ON
CORPORATE
RESPONSIBILITY

ABOUT THE INTERFAITH CENTER ON CORPORATE RESPONSIBILITY (ICCR):

Celebrating its 47th year, ICCR is the pioneer coalition of shareholder advocates who view the management of their investments as a catalyst for social change. Its 300 member organizations comprise faith communities, socially responsible asset managers, unions, pension funds, NGOs and other socially responsible investors with combined assets of over \$400 billion. ICCR members engage hundreds of corporations annually in an effort to foster greater corporate accountability.

ACKNOWLEDGEMENTS

This report is based on earlier reports that assess the state of methane disclosure in the oil & gas sector. ICCR adapted several metrics from the Environmental Defense Fund report [Disclosure Divide: Revisiting Rising Risk and Methane Reporting in the U.S. Oil & Gas Industry](#) and [Disclosing the Facts 2017: Transparency and Risk in Methane Emissions](#) prepared by As You Sow, Boston Common Asset Management and the Investor Environmental Health Network. ICCR built upon these reports to not only track methane disclosure, but also demonstrate the impact of shareholder engagement over the past several years.

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INTRODUCTION

In the face of a warming climate, investors are increasingly concerned with managing methane-related risk in the oil and gas industry. Natural gas is often touted as a “transitional” fuel, yet methane is a powerful climate forcer up to 86 times more powerful than carbon dioxide in the short-term. Both investors and companies are recognizing the need to consider the many economic, environmental, regulatory and public health-related risks associated with methane emissions. In 2015, ICCR launched a concerted campaign on methane with the goal of engaging primarily U.S. companies across the value chain on improving disclosure, reducing emissions and reporting critical information on methane management efforts, such as leak detection and repair (LDAR).

This report is designed to educate investors on the state of methane disclosure in the industry as well as to track the impact of shareholder engagement since the inception of the Methane Campaign. Twenty-three companies engaged by the ICCR investor network are evaluated against a series of methane-specific metrics that are considered material to shareholders. These metrics address a range of topics that help investors better understand a company’s ability to hedge methane-related financial, regulatory and reputational risks. The “Progress on Methane Disclosure Grid” found in this report is based on the methane reporting frameworks used in the Environmental Defense Fund’s 2018 report, “Disclosure Divide: Revisiting Rising Risk and Methane Reporting in the U.S. Oil & Gas Industry” and “Disclosing the Facts 2017: Transparency and Risk in Methane Emissions” prepared by As You Sow, Boston Common Asset Management and the Investor Environmental Health Network. In addition

to tracking methane disclosure, the grid also indicates which metrics the companies began reporting on due to the impact of ICCR investor engagement over the past several years. The information found in the “Company Data” section elaborates on the reporting details for each company, providing a tool for investors to utilize when engaging companies in the upcoming proxy season.

HISTORY OF THE METHANE CAMPAIGN

ICCR’s investor network has engaged the private sector on climate challenges and opportunities since 2002 and has been active in advocating for a transition to a more sustainable and equitable economy. ICCR’s investor network began engaging the oil and gas industry specifically on methane emissions reductions in 2007 and collaborated with the Investor Environmental Health Network (IEHN) to address concerns related to horizontal drilling (fracking). Two active members, As You Sow and Boston Common Asset Management, with IEHN, launched the Disclosing the Facts reporting process in 2014 with the initial report called “Extracting the Facts” published jointly with ICCR.

In 2007, ICCR members filed shareholder resolutions with several oil & gas companies on emissions reductions, with methane mentioned as a concern. ICCR’s members filed the first methane-specific resolutions in 2008 with ONEOK Inc., The Williams Companies, OGE Energy Corporation and El Paso Corporation, raising concerns about methane’s outsized warming potential, and requesting the companies adopt GHG reduction targets. Since 2008, ICCR members have filed over 60 different resolutions and engaged 45 companies in dialogue specifically on methane emissions reduction.

REPORT METHODOLOGY

This report evaluates twenty-three upstream and midstream oil & gas companies on thirteen methane-specific metrics (shown on the “Progress on Methane Disclosure Grid”) that are considered material by ICCR’s investor network. Nine of the thirteen metrics used in this analysis are drawn from the Environmental Defense Fund’s 2018 report *Disclosure Divide: Revisiting Rising Risk and Methane Reporting in the U.S. Oil & Gas Industry*. While several of these metrics are also found in *Disclosing the Facts 2017: Transparency and Risk in Methane Emissions*, ICCR specifically adapted two metrics from *Disclosing the Facts*. Two metrics were developed by ICCR.

ICCR evaluated each company on the metrics at the right using a variety of sources including: information published on company websites, 2017 CDP Climate Change responses, 2017 corporate sustainability reports, and other online sources such as company factsheets. Metrics highlighted in dark blue on the “Progress on Methane Disclosure Grid” indicate progress influenced by ICCR member engagements over the past several years. Metrics highlighted in light blue indicate progress made by companies that is not necessarily due to ICCR member engagement. Commitments made via company dialogues that are not yet publicly available are not included in this report. The progress shown in the colored boxes are indicative of ICCR member investor engagement only. Progress that may have been made by other investor networks is not highlighted. ICCR’s investor member network influenced certain companies to join voluntary initiatives such

as ONE Future, the EPA Natural Gas STAR Program and the Guiding Principles on Methane. For those companies that have the “Participates in Voluntary Initiatives” metric highlighted in dark blue, please see the Company Details section for information on which specific initiative investors influenced the companies to join. For further details on the scoring methodology utilized in this report see Appendix A.

EDF DISCLOSURE DIVIDE 2018:

1. Reports Methane Emissions as a Standalone Figure
2. Reports Methane Emissions as a Rate
3. Reports a Quantitative Methane Goal
4. Participates in Voluntary Initiatives
5. Reports Position on Methane Regulations
6. Discusses General LDAR Use
7. Reports LDAR Program Scope
8. Reports LDAR Frequency
9. Reports LDAR Methodology

DISCLOSING THE FACTS 2017:

10. Discusses Replacement of Pneumatic Controllers
11. Discloses Method(s) Used to Estimate Methane Emissions

INTERFAITH CENTER ON CORPORATE RESPONSIBILITY:

12. Uses Direct Measurement and/or Company Specific Emissions Factors
13. Reports to CDP

PROGRESS ON METHANE DISCLOSURE

Action taken (ICCR engagement)
 Action taken
 No action taken

| COMPANY | Reports Methane Emissions as a Standalone Figure | Reports Methane Emissions as a Rate | Reports a Quantitative Methane Goal | Participates in Voluntary Initiatives (EPA STAR, ONE Future, Guiding Principles only) | Reports Position on Methane-Related Regulations | Discusses General LDAR Use | Reports LDAR Program Use | Reports LDAR Program Scope | Reports LDAR Frequency | Discloses Method(s) Used to Estimate Methane Emissions | Uses Direct Measurement and/or Company Specific Emissions Factors | Discusses Replacement of Pneumatic Controllers | Reports to CDP |
|---------------------------|--|-------------------------------------|-------------------------------------|---|---|----------------------------|--------------------------|----------------------------|------------------------|--|---|--|----------------|
| Anadarko Petroleum | | | | | | | | | | | | | |
| Antero Resources | | | | | | | | | | | | | |
| Apache Corporation | | | | | | | | | | | | | |
| BHP | | | | | | | | | | | | | |
| BP* | | | | | | | | | | | | | |
| Cabot Oil & Gas | | | | | | | | | | | | | |
| Chesapeake Energy | | | | | | | | | | | | | |
| Chevron | | | | | | | | | | | | | |
| ConocoPhillips | | | | | | | | | | | | | |
| Devon Energy | | | | | | | | | | | | | |
| Energen Resources | | | | | | | | | | | | | |
| EOG Resources | | | | | | | | | | | | | |
| EQT Resources | | | | | | | | | | | | | |
| Equinor | | | | | | | | | | | | | |
| ExxonMobil | | | | | | | | | | | | | |
| Kinder Morgan | | | | | | | | | | | | | |
| Noble Energy | | | | | | | | | | | | | |
| Occidental Petroleum | | | | | | | | | | | | | |
| Pioneer Natural Resources | | | | | | | | | | | | | |
| Range Resources | | | | | | | | | | | | | |
| Royal Dutch Shell* | | | | | | | | | | | | | |
| Seneca (National Fuel) | | | | | | | | | | | | | |
| Southwestern | | | | | | | | | | | | | |

* These companies are included in this chart for the purposes of benchmarking only

SUMMARY

Over the course of the campaign, the 21 U.S. companies tracked in this report responded positively to ICCR investor engagement on methane. During the 2018 proxy season, seven companies engaged by ICCR members improved methane management and disclosure. Investors succeeded in pushing companies to disclose critical information ranging from LDAR program details and emissions figures to company-specific methane reduction efforts. ICCR members filed eight methane-related resolutions this season of which half were successfully withdrawn, including Anadarko, Devon Energy, EQT Resources and Energen Resources. EQT Resources, the largest natural gas producer in the U.S., made notable improvements in methane disclosure and now reports on eight additional metrics found on the “Progress on Methane Disclosure Grid”. The company also committed to join the ONE Future Coalition, a voluntary industry initiative of companies across the natural gas value chain committed to achieving an average rate of methane emissions equivalent to one percent (or less) of total natural gas production.

Those resolutions that went to vote this season saw strong results. The resolution filed by the Unitarian Universalist Association with Range Resources received a majority vote of 50.25%, the second methane-related resolution to win a majority vote in the U.S. This resulted in a constructive dialogue which investors expect to lead to important progress. Kinder Morgan, a major pipeline company, received a strong vote of 38% on a methane resolution filed by Miller/Howard Investments. With large investors convinced of the need for the company to provide greater disclosure, Kinder Morgan published website updates with

details on their LDAR program in May 2018. Finally, at the 2018 Chevron annual general meeting, approximately 45% of the company’s shareholders voted in favor of the fugitive methane emissions reduction resolution filed by As You Sow, an indication of the level of investor concern about the company’s methane management and disclosure. Two weeks before the annual general meeting Chevron signed onto the Guiding Principles on Methane, a voluntary commitment made by eight European and U.S. companies to reduce methane emissions and support meaningful regulation of their natural gas assets around the world. This was not, however, seen as sufficient grounds for withdrawing the resolution.

The progress made during the 2017-18 season builds upon a campaign that has seen success with companies across the value chain since 2015. We would highlight especially the progress made with companies through the race to the top process represented in the [Disclosing the Facts](#) reports. UN PRI members have also engaged companies on methane management and disclosure, which has signaled investor concern on methane internationally. Investors both in the US and in Europe have seen a steady increase in willingness by oil & gas companies to more closely monitor and control methane emissions in their operations. This report is conservative in assuming investor influence on company decisions to report on specific metrics. In some cases, it is not possible to know whether shareholder engagement was responsible for a specific action taken by a company, so we have not indicated influence in those cases. Investors believe, though, that their increased focus on methane has led

to action by companies even where it is not clearly attributable to specific engagements.

NEXT STEPS

Investors' combined efforts are sending a powerful message to the natural gas energy sector. As more companies are recognizing the need to respond to investor concerns, methane reporting is gaining momentum worldwide, particularly among exploration and production companies where the largest emissions are to be found. The majority of companies involved in ICCR's Methane Campaign have responded positively to investor demands to better manage methane related risks and opportunities. Moving forward, ICCR sees the value in continuing its efforts to press for improved methane management and disclosure across the value chain. For companies that are more advanced in their reporting, ICCR's investors find it useful to focus on the adoption of methane targets. Two companies committed to join the ONE Future Coalition this year. EQT joined in the spring of 2018, and Noble Energy joined in September. Major players including BP and ExxonMobil announced methane targets in early 2018 following strong shareholder pressure. ICCR will encourage the adoption of methane targets in the upcoming season to support even greater efficiency and accountability for methane emissions reduction in the long term.

Methane is an increasingly critical issue for companies, investors and society at large. While ICCR is committed to engaging companies in the natural gas supply chain on methane management best practices, the need to transition to a clean energy economy that protects the well-being of communities and the natural world remains a long-term priority.

ICCR's diverse coalition has been active in fostering greater corporate accountability for nearly fifty years and remains committed to engaging the energy sector in the years to come.

COMPANY DATA

ANADARKO PETROLEUM ¹

- **Participates in Voluntary Initiatives:**
EPA Natural Gas Star Program, API Environmental Partnership
- **Position on Methane-Related Regulations:**
Anadarko's corporate position on the regulation of methane - "support with major exceptions"²
- **LDAR Methodology/Use:**
Audio, Visual and Olfactory (AVO) inspections and forward-looking infrared (FLIR) camera surveys are the two main methodologies for identifying leaks. FLIR cameras are employed for tasks such as commissioning of new facilities, maintenance of existing facilities, and adhering to regulated and voluntary LDAR programs implemented to repair and document leaks.⁴
- **LDAR Scope:**
Leak Detection and Repair (LDAR) is employed at all U.S. onshore facilities operated by Anadarko.
- **LDAR Frequency:**
One-hundred percent of Anadarko's facilities are subject to voluntary, state or federal fugitive component leak monitoring through AVO or FLIR camera inspection methodologies, on a monthly to annual basis.
- **Replacement of Pneumatic Controllers:**
In 2018, Anadarko committed to evaluating and replacing one-hundred percent of high-bleed devices through The Environmental Partnership voluntary program.
- **Discloses Method(s) Used to Estimate Methane Emissions:**
Under the GHGRP, greenhouse gases, including methane, are calculated using agency-documented methodologies. In order to calculate greenhouse gases in the total units of CO₂e gases, a mixture of indirect and direct measurements is utilized. Indirect measurements combine GHG source counts, U.S. EPA-provided emissions factors, and basin-specific GHG compositions.

- **Reports to CDP:**
Reported to CDP in [2017](#). Did not complete the O&G module.

ANTERO RESOURCES

- **Participates in Voluntary Initiatives:**
Antero is an EPA Natural Gas Star Program partner³.
- **LDAR Methodology/Use:**
"Antero has implemented a LDAR program for the company's well pads and compressor station operations. This program includes the use of state-of-the-art Forward Looking Infra-Red (FLIR) cameras to conduct optical gas imaging (OGI) inspections which identify the smallest of leaks."⁴
- **LDAR Scope:**
While the LDAR Program is not mandatory in all areas where Antero operates, the company has elected to implement it across all areas of operations in West Virginia and Ohio⁵.
- **Replacement of Pneumatic Controllers:**
"Per applicable NSPS Quad O regulations, the company installs low-bleed pneumatic controls at well pads, which also reduce methane emissions. At certain sites, Vapor Recovery Towers (VRT) are utilized to reduce flashing of emissions from storage tanks."⁶

APACHE CORPORATION ⁷

- **Methane Emissions Rate:**
"In 2016, our global methane emissions intensity was 0.43 percent, a reduction of 12 percent compared to 2015."
- **Quantitative Methane Goal:**
"The upstream sector target committed to by ONE Future is 0.36 percent or less of methane emitted from 2025 gross methane production (also called methane emissions intensity) – and Apache has adopted this same goal."

- **Participates in Voluntary Initiatives:** EPA Natural Gas Star Program; company joined ONE Future in response to ICCR member engagement.
- **LDAR Methodology/Use:** “Field employees are trained to perform olfactory, visual and audio (OVA) inspections for possible leaks as a part of their overall competency training.” “We use optical gas imaging (OGI) cameras to identify the leak and verify that it has been repaired successfully.”
- **LDAR Frequency:** All facilities constructed after September 2015 are inspected with an OGI camera before they come online. These facilities are reexamined annually with an OGI camera. New and existing facilities are inspected during regular operations.
- **Replacement of Pneumatic Controllers:** “Apache installs low-bleed or no-bleed natural gas or compressed air pneumatic controllers, which have reduced methane emissions, on all new facilities. In our U.S. onshore operations, 35 percent of existing controllers are high-bleed natural gas pneumatic controllers.”

BHP

- **Methane Emissions as a Standalone Figure:** FY2016 Gross Global Scope 1 CH4 Emissions of 2,462,200 metric tons reported to CDP.
- **Methane Rate:** Total methane emissions as a per cent of natural gas production FY2016⁸
 - Eagle Ford - 0.16%
 - Fayetteville - 0.32%
 - Haynesville - 0.13%
 - Permian - 0.31%
- **Methane Target:** ONE Future goal of 0.36% methane leakage rate by 2025 for the production sector

- **Participates in Voluntary Initiatives:** API Environmental Partnership; company joined ONE Future in response to ICCR member engagement.
- **LDAR Methodology/Use:** “We monitor methane emissions from valves, pump seals, compressor seals, and pressure safety valves with a Toxic Vapor Analyzer utilizing Flame Ionization Detection (FID) or Photo Ionization Detection (PID) under EPA’s Method 21 as part of our leak detection and repair program.”⁹
- **LDAR Frequency:** BHP Billiton conducts quarterly LDAR monitoring as well as weekly audio-visual-olfactory walk-through inspection of all components.¹⁰
- **LDAR Scope:** BHP monitors about 40 production pads and six compressor facilities at its Eagle Ford facilities and monitors one of its compressor facilities at the Fayetteville play as part of the US Environmental Protection Agency’s Mandatory Greenhouse Gas Reporting Subpart W requirements.¹¹
- **Replacement of Pneumatic Controllers:** “We have replaced all high-bleed pneumatic control valves with low-bleed control valves that emit significantly less methane during operation at all of our well sites in each shale play.”¹²
- **Reports to CDP:** Completed [2017](#) CDP report. Did not complete OG module.

BP

- **Methane Emissions as a Standalone Figure:** FY2016 Gross Global Scope 1 CH4 Emissions of 4,030,000 metric tons CO2e reported to CDP.
- **Methane Emissions Rate:** “2017 methane intensity = 0.2%. This includes the methane emissions from operations where

COMPANY DATA

gas goes to market as a percentage of that gas – accounting for more than 90% of methane emissions from our operated oil and gas assets.”¹³

- **Methane Target:**
“So, we are targeting a methane intensity of 0.2%, and holding it below 0.3%.”¹⁴
- **Participates in Voluntary Initiatives:**
Climate and Clean Air Coalition (CCAC) Oil and Gas Methane Partnership; Oil and Gas Climate Initiative (OGCI); EPA Natural Gas STAR Program
- **LDAR Methodology/Use:**
“Depending on the location, we use infrared cameras, centralized monitoring stations, sniffer dogs, or other inspection techniques to help to detect any gas leak.”¹⁵
- **Replacement of Pneumatic Controllers:**
“More than a decade ago, we began swapping out our high-bleed controllers with ones that emit less methane. Since then, we’ve replaced 10,000 devices. We are now in the final stretch, looking at ways to replace the last 1%.”¹⁶
- **Reports to CDP:**
Reported in [2017](#) and completed OG module.

CABOT OIL AND GAS ¹⁷

- **Participates in Voluntary Initiatives:**
company joined EPA Natural Gas STAR Program in response to ICCR member engagement.
- **LDAR Program Methodology/Use:**
To help identify and minimize methane emissions, Cabot employs the use of optical gas imaging (OGI) cameras for leak-detection inspections.
- **LDAR Frequency/Scope:**
“On a quarterly to semi-annual basis, Cabot conducts fugitive leak monitoring of our assets, consisting of wellsite, central tank battery, and satellite facilities in the Gulf and Appalachian Basins.”

- **Discloses Method(s) Used to Estimate Methane Emissions:**
Cabot is subject to the annual reporting of GHG emissions under 40 CFR Part 98, Subpart W, which mandates source-specific calculation methodologies and emission factors.
- **Replacement of Pneumatic Controllers:**
Cabot’s internal policy has been to install zero-bleed pneumatic controllers at all new facilities operating on natural gas or employ instrument air and convert all existing controllers to zero-bleed or remove them from service.

CANADIAN NATURAL RESOURCES ¹⁸

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 202,110 metric tons CO₂e reported to CDP.
- **Methane Emissions Rate:**
Reported methane emissions rate in 2017 CDP response of 0.61% for year ending in 2015. Emissions rate for 2016 not reported.
- **Methane Target:**
Reported a GHG intensity target to CDP in 2017 that does not include a target year or a baseline year. Company states “methane emissions were incorporated into targets reported”.
- **Participates in Voluntary Initiatives:**
Founding member of the Canada Oil Sands Innovation Alliance (COSIA). Collaborates with industry through a joint initiative between the Petroleum Technology Alliance of Canada (PTAC) and the Canadian Association of Petroleum Producers (CAPP) to test new technology that accelerates leak detection and repairs
- **Position on Methane-Related Regulations:**
Supports the regulation of methane emissions with minor exceptions

- **LDAR Use:**
“The goal of Canadian Natural’s Fugitive Emission Management and Control (FEMC) program is to reduce fugitive emissions by providing an efficient means to identify larger gas leaks and prioritize them for repair.”
- **LDAR Scope:**
“In Alberta, the [FEMC] procedure applies to any location that has more than 1,000 hp (utilized) of reciprocating compression and sweet gas streams (< 1% H₂S). In British Columbia, the procedure applies to any location that has more than 250 hp (rated) of reciprocating compression and streams with gas containing greater than 10% CH₄ plus CO₂ by weight. These thresholds result in more than 200 facilities being addressed by the FEMC.”
- **LDAR Frequency/Methodology:**
“Regular targeted monitoring using hand held gas detectors is performed on component with a medium to high leak potential, on a quarterly or annual basis depending on specific component types. Comprehensive leak surveys of facilities are performed once every 3 to 5 years using an infrared leak imaging camera and Hi Flow Sampler to detect and quantify fugitive emissions.”
- **Replacement of Pneumatic Controllers:**
“Voluntary methane emissions reduction programs that are being developed include retrofitting pneumatic devices and gas conservation from primary heavy oil beyond the requirements of AER Directive 60.”
- **Discloses Method(s) Used to Estimate Methane Emissions:**
Estimates >75% of methane emissions using engineering calculations
- **Reports to CDP:**
Reported to CDP in [2017](#).

CHESAPEAKE ENERGY

- **Methane Emissions as a Rate:**
2017 Methane loss rate - 0.20% (Emissions estimate developed under the EPA’s Greenhouse Gas Reporting Program)¹⁹
- **Participates in Voluntary Initiatives:**
EPA Natural Gas STAR program
- **LDAR Frequency:**
Frequency of inspections varies between quarterly, annually and semi-annually. Detailed FLIR inspection schedule per shale play is available on website.²⁰
- **LDAR Methodology/Use:**
CHK utilizes 13 infrared FLIR cameras. More than 2,900 FLIR inspections were completed in 2017. Operators also conduct regular onsite AVO inspections as a part of routine activities, often on a daily basis.²¹
- **LDAR Scope:**
“All sites are considered for surveying, and we utilize a risk-based approach to determine which sites should be voluntarily inspected at prescribed times. Of the sites we surveyed in 2017, more than 60% were inspected voluntarily.” List of shale plays inspected under LDAR program is available on website.²²
- **Replacement of Pneumatic Controllers:**
CHK uses low- or intermittent-bleed pneumatic controllers as a well lifecycle emissions reduction practice.²³

CHEVRON CORPORATION

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 4,900,000 metric tons CO₂e reported to CDP.

COMPANY DATA

- **Participates in Voluntary Initiatives:** EPA Natural Gas STAR Program, API Environmental Partnership; company joined Oil and Gas Methane Partnership Guiding Principles in response to ICCR member engagement.
- **Position on Methane-Related Regulations:** Supports the regulation of methane emissions with major exceptions²⁴
- **LDAR Methodology/Use:** "We use infrared cameras in select oil and gas operations around the globe to help pinpoint leak locations so that we can address them. In many locations where we operate, we implement procedures to comply with regulatory requirements pertaining to leak detection and repair."²⁵
- **Discloses Method(s) Used to Estimate Methane Emissions:** >75% of methane emissions estimated using engineering calculations
- **Replacement of Pneumatic Controllers:** Chevron is a founding member of API. "The initiative will focus on retrofitting high-bleed pneumatic controllers with low- or zero-emitting devices and implementing the monitoring and timely repair of fugitive emissions."²⁶
- **Reports to CDP:** Reported to CDP in [2017](#). Completed O&G Module.
- **Methane Target:** Conoco does not have a methane-specific quantitative reduction target. The company adopted a GHG target that incorporates methane. Conoco set a target to reduce GHG emissions intensity between 5 and 15% by 2030, from a 2017 baseline. The target covers all greenhouse gases, but in practice this will apply to carbon dioxide and methane emissions.²⁷
- **Participates in Voluntary Initiatives:** API Partnership, EPA Natural Gas STAR Program
- **LDAR Frequency:** "At many of our locations, particularly those with control devices and at compressor stations, we have instituted a periodic (typically annual) voluntary fugitive monitoring program using forward looking infrared (FLIR) optical gas imaging (OGI) cameras to enhance our leak detection and repair (LDAR)."²⁸
- **LDAR Methodology/Use:** "In our Lower 48 Business Unit, audio, visual, olfactory (AVO) inspections are routinely performed as part of operator rounds to identify any leaks or other issues."²⁹
- **Replacement of Pneumatic Controllers:** "While regulations now restrict the use of high-bleed pneumatic devices on new installations, we voluntarily replaced over 98 percent of our existing high-bleed installations across our operations with no- or low-emission controllers."³⁰
- **Discloses Method(s) Used to Estimate Methane Emissions:** Conoco Phillips uses engineering calculations, source specific emissions factors and direct measurement³¹
- **Uses Direct Measurement or Company Specific Emissions Factors:** >0% - <5% of total methane emissions are estimated using direct detection and measurement³²
- **Reports to CDP:** Reported to CDP in [2017](#). Complete O&G module.

CONOCOPHILLIPS

- **Methane Emissions as a Standalone Figure:** FY2016 Gross Global Scope 1 CH₄ emissions of 5,293,022 metric tons CO₂e reported to CDP.
- **Methane Emissions Rate:** 2016 methane emissions rate = 0.1% (expressed as a % of natural gas production or throughout at a given segment)
- **Reports to CDP:** Reported to CDP in [2017](#). Complete O&G module.

DEVON ENERGY ³³

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 961,162 metric tons CO₂ reported to CDP.
- **Methane Emissions Rate:**
FY2015 methane emissions rate of 0.61% reported on 2016 CDP response
- **Methane Target:**
 - Devon does not have a methane-specific quantitative reduction target. The company adopted a GHG target that incorporates methane emissions.
 - GHG target: 20% reduction of GHG emissions intensity by 2017 compared to 2011 base year.
- **Participates in Voluntary Initiatives:**
API Environmental Partnership, Devon Canada participates in the EPA Natural Gas Star program
- **LDAR Methodology/Use:**
LDAR protocol establishes the process of using infrared cameras to evaluate emissions
- **LDAR Scope:**
In 2016 approximately 11% of Devon's U.S. facilities received surveys.
- **LDAR Frequency:**
"With respect to Devon's voluntary LDAR program in the U.S., the survey frequency varies among Devon's operating areas depending on the volume, rate, and characteristics of the hydrocarbons Devon produces. The program categorizes facilities and assets to concentrate efforts on sites with the highest production volume/rate or highest potential for leakage based on facility equipment and design."
- **Discloses Method(s) Used to Estimate Methane Emissions:**
Estimates methane emissions using:
 - Engineering calculations >75%
 - Source-specific emission factors (IPCC Tier 3) >0% - <5%

- IPCC Tier 1 and/or Tier 2 emission factors 5% - 10%
- **Replacement of Pneumatic Controllers:**
"Devon has performed high-bleed pneumatic controller replacement projects in the past on its assets. Most of those assets have since been sold. Devon currently does not have a program to find and replace existing high-bleed controllers, but Devon believes that its current assets do not contain a high number of those controllers because it has been using low- or intermittent-bleed controllers since August 2011."³⁴
- **Reports to CDP:**
Responded to CDP in [2017](#) and completed OG module.

ENERGEN RESOURCES ³⁵

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 66,002 Mt CO₂e
- **Participates in Voluntary Initiatives:**
EPA Natural Gas Star Program
- **LDAR Methodology/Use:**
Twice a year, a certified thermographer is used to identify leaks and work with operations personnel to repair leaks as soon as possible.
- **LDAR Scope:**
While approximately 5% of existing facilities are required to be covered by the LDAR program, all future facilities are expected to be covered.
- **LDAR Frequency:**
Twice a year, a certified thermographer is used to identify leaks and work with operations personnel to repair leaks as soon as possible.
- **Reports to CDP:**
2015-17 CDP Climate Change responses were submitted but **not scored**.

COMPANY DATA

EOG RESOURCES

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH4 emissions of 15,679 metric tons CO2e reported to CDP.
- **Methane Rate:**
2016 methane intensity rate of .19% as a percentage of total oil and gas production³⁶
- **LDAR Methodology/Use:**
A substantial part of the monitoring under EOG's LDAR program is conducted through the use of infrared cameras and other thermal imaging technology.³⁷
- **LDAR Scope:**
"The LDAR program is reviewed periodically by EOG and is applicable to all EOG production locations regardless of whether such locations are subject to a state or federally mandated LDAR program."³⁸
- **LDAR Frequency:**
EOG will monitor and repair leaks within the mandated time frame in accordance with regulatory requirements. These time periods being: semiannual monitoring of well sites, quarterly monitoring of compressor stations, leaks repaired within 30 calendar days, resurveys of repaired leaks within 30 calendar days of said repair.³⁹
- **Replacement of Pneumatic Controllers:**
"EOG has also incorporated into its normal operating practices reduced emissions completion systems, multi-well pads, intermittent/low-bleed controllers."⁴⁰
- **Discloses Method(s) Used to Estimate Methane Emissions:**
>75% of methane emissions are estimated using engineering calculations⁴¹
- **Reports to CDP:**
Reported to CDP in [2017](#). Completed O&G Module.

EQT RESOURCES ⁴²

- **Methane Emissions as a Standalone Figure:**
EQT reported total methane emissions of 27,300 tons in 2016.
- **Methane Emissions Rate:**
"Production operations had a methane intensity of 4.8 mtons/Bcfe and Midstream operations had a methane intensity of 14 mtons/Tbtu"
- **Methane Target:**
Company joined ONE Future in response to ICCR member engagement.
- **Participates in Voluntary Initiatives:**
ONE Future member
- **LDAR Methodology/Use:**
LDAR surveys are conducted using OGI Cameras.
- **LDAR Scope:**
"OGI monitoring is currently performed on more than 30% of our compressor stations and dehydration facilities and 65% of our unconventional wellpads. Beginning in 2018, EQT will perform OGI monitoring on every unconventional well pad."
- **LDAR Frequency:**
The frequency of LDAR tests can range from monthly to annually.
- **Replacement of Pneumatic Controllers:**
"In 2016, EQT commenced a high-bleed controller replacement program and replaced 515 pneumatic devices with intermittent-bleed or low-bleed controllers. As of Q1 2018, we are operating four high-bleed pneumatic controllers, which represents less than 0.04% of our total controller count."
- **Discloses Method(s) Used to Estimate Methane Emissions:**
"EQT emissions data is based on Stack Test Data, Manufacturer's Data, and/or U.S. Environmental Protection Agency (EPA) published emission factors."⁴³

EQUINOR (STATOIL) ⁴⁴

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 604284 metric tons CO₂e reported to CDP.
- **Participates in Participates in Voluntary Initiatives:**
Equinor was a founding partner of the Climate and Clean Air Coalition's Oil and Gas Methane Partnership (OGMP) set up in 2011. The company is part of the Oil and Gas Climate initiative (OGCI); company joined ONE Future in response to ICCR member engagement.
- **Reports Position on Methane-Related Regulations:**
The company supports the regulation of methane emissions with minor exceptions.
- **LDAR Frequency/Use:**
"For our upstream, offshore, as well as mid-stream, operations, each installation or facility is required to define the interval (at least weekly) for the monitoring of fugitive hydrocarbon emissions. Also of note, for our Norwegian, land-based processing and refining facilities, measurement using DIAL (Differential Absorption Lidar) is conducted approximately every three years."
- **LDAR Methodology:**
Laser sensing technology (open path laser sensor – OPLS), "sniffers", and FLIR cameras are used for inspections.
- **Discloses Method(s) Used to Estimate Methane Emissions / Uses Direct Measurement:**
Equinor estimates total methane emissions using:
 - Direct Detection and Measurement: 5% - <10%
 - Engineering Calculations: 25% - <50%
 - Source-specific emissions factors (IPCC Tier 3): 25% - <50%
 - IPCC Tier1 and/or Tier 2 emission factors: 25% - <50%
- **Replacement of Pneumatic Controllers:**
100% of the organization's high-bleed controllers have been replaced with low-emission alternatives (USA only)⁴⁵

- **Reports to CDP:**
Responded to CDP in [2017](#) and completed the O&G module.

EXXONMOBIL (XTO ENERGY) ⁴⁶

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 7000000 metric tons CO₂e reported to CDP for XTO Energy.
- **Methane Emissions as a Rate:**
FY2016 methane emissions rate for XTO Energy exploration, production & gas processing of 0.66%
- **Methane Target:**
ExxonMobil announced a target to reduce methane emissions by 15% by 2020 and reduce flaring by 25%⁴⁷
- **Participates in Voluntary Initiatives:**
CCAC, API Environmental Partnership; company joined Oil and Gas Methane Partnership Guiding Principles in response to ICCR member engagement.
- **LDAR Methodology/LDAR Use:**
LDAR surveys are conducted using AVO inspections and optical gas imaging.
- **LDAR Frequency/Scope:**
"Under our 2017 program, every XTO asset division is required to conduct annual, and in some instances semi-annual, surveys in order to meet both voluntary production-based targets and regulatory requirements."
- **Discloses Method(s) Used to Estimate Methane Emissions/Uses Direct Measurement:**
Methane emissions estimated using the following methodology for XTO Energy:
 - Direct detection and measurement (>0% to <5%)
 - Engineering calculations (10% to <25%)
 - Source-specific emission factors (IPCC Tier 3) >75%

COMPANY DATA

- **Replacement of Pneumatic Controllers:**
“We continue to replace high-bleed pneumatic devices with lower-emission technology and conduct reduced emissions completions in our ongoing efforts to enhance the environmental performance of our operations.”
- **Reports to CDP:**
Reported to CDP in [2017](#). Completed O&G Questionnaire

HUSKY ENERGY INC. ⁴⁸

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 3,003,000 metric tons CO₂e reported to CDP.
- **Methane Target:**
Husky adopted an external GHG target set by regulators. Husky met its target to reduce CO₂e emissions by 15% by 2016. Methane emissions were incorporated into this target.
- **Reports Position on Methane-Related Regulations:**
Husky supports the regulation of methane emissions.
- **LDAR Use/Frequency/ Methodology:**
“Monitoring frequencies are generally flexible and variable with an annual baseline frequency. Methodologies used included infrared cameras, hand held gas detectors, soapy water investigations on point sources, toxic/organic vapor analyzers, photo ionization detector, ultrasound probe, or third-party evaluation or other justifiable and defensible methods.”
- **Discloses Method(s) Used to Estimate Methane Emissions:**
>75% of methane emissions are estimated using engineering calculations
- **Replacement of Pneumatic Controllers:**
“We have started to reduce methane emissions through the conversion of pneumatic devices.....

reducing methane through high-bleed to low-bleed pneumatic conversion.”

- **Reports to CDP:**
Reported to CDP in [2017](#). Completed OG Module

KINDER MORGAN ⁴⁹

- **Participates in Voluntary Initiatives:**
ONE Future, EPA Natural Gas STAR Program
- **Position on Methane-Related Regulations:**
“In 2015 and again in 2016, the EPA finalized rules to regulate methane emissions from the production, gathering and processing, and transmission and storage sectors of the oil and natural gas industry. We strongly supported the implementation of voluntary methane emission reductions in the final regulatory regime.”
- **LDAR Methodology/Frequency/Use:**
“For calendar year 2017, we performed annual leak surveys using an Optical Gas Imaging (OGI) camera and reported greenhouse gas (GHG) emissions at 47% of our stations under the EPA’s Greenhouse Gas Reporting Program (GHGRP).”
- **LDAR Scope:**
“In 2017, we extended annual leak surveys to include an additional 20% of those stations not already surveyed annually under the EPA’s GHGRP. We have committed to continuing to expand the leak survey and maintenance program by an additional 20% of our stations each year so that by 2021 100% of our transmission and storage stations are scheduled to have annual leak surveys.”
- **Replacement of Pneumatic Controllers:**
KMI has achieved methane emissions reductions since 1993 through “replacing high-bleed pneumatic devices, installing vapor recovery systems on liquid storage tanks, installation of gas turbine and electric motor driven compression, and implementation of other methane reduction technologies.”

NOBLE ENERGY, INC.

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 20,361 metric tons reported to CDP.
- **Methane Emissions as a Rate:**
Methane as a % of natural gas production = .18% in FY2017⁵⁰
- **Participates in Voluntary Initiatives:**
EPA Natural Gas STAR, API Environmental Partnership; ONE Future
- **Position on Methane-Related Regulations:**
Noble reported to CDP that it supports the regulation of methane emissions “with minor exceptions.”
- **LDAR Methodology/Scope:**
“This program uses infrared cameras and Audio, Visual, Olfactory (AVO) detection to identify fugitive leaks from production equipment. We have now expanded this program to all our U.S. onshore operations.”⁵¹
- **LDAR Frequency:**
Depending on the site’s VOC emissions, monitoring requirements are either monthly, quarterly, or annually.⁵²
- **Discloses Method(s) Used to Estimate Methane Emissions:**
Yes
- **Uses Direct Measurement or Company Specific Emissions Factors⁵³:**
 - Direct Detection and Measurement: 5% to <10%
 - Engineering calculations: >75%
 - Source-specific emission factors (IPCC Tier 3): >75%
 - IPCC Tier 1 and/or Tier 2 emission factors: >0% to <5%
- **Replacement of Pneumatic Controllers:**
Noble has an emissions reduction project to replace all high-bleed pneumatic devices with low-bleed pneumatic devices on all onshore locations in the U.S.⁵⁴

- **Reports to CDP:**
Reported in [2017](#) and completed OG questionnaire.

OCCIDENTAL PETROLEUM ⁵⁵

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 25000 metric tons reported to CDP.
- **Participates in Participates in Voluntary Initiatives:**
EPA Natural Gas STAR Program
- **Position on Methane-Related Regulations:**
Discloses position as “neutral” to CDP on the regulation of methane emissions
- **LDAR Methodology/LDAR Use:**
Oxy uses Infrared (IR) cameras to visually identify possible emissions leaks.
- **LDAR Scope:**
“In 2016, Oxy completed 132 LDAR surveys in its Permian Basin acreage. This coverage included 173 equipment sites.”
- **Replacement of Pneumatic Controllers:**
“Adopting better control devices (e.g., low-bleed or no-bleed pneumatic valves) has reduced our methane emissions by 55 percent.”
- **Discloses Method(s) Used to Estimate Methane Emissions /Uses Direct Measurement:**
 - Direct Detection and Measurement: >0% to <5%
 - Engineering Calculations: 25% to <50%
 - Source-specific emissions factors (IPCC Tier 3): 50% to <75%
 - IPCC Tier1 and/or Tier 2 emission factors: 0%
- **Reports to CDP:**
Reported to CDP in [2017](#)

COMPANY DATA

PIONEER NATURAL RESOURCES ⁵⁶

- **Methane Emissions as a Rate:**
2016 methane emission intensity of 6.14 metric tons of CO₂ equivalent/MBOE
- **Participates in Voluntary Initiatives:**
EPA Natural Gas STAR Program
- **LDAR Use/Methodology/Scope:**
“We utilize various techniques such as audio, visual, and olfactory inspections, optical gas imaging cameras, and Remote Methane Leak Detectors™ across all of Pioneer’s operations.”
- **LDAR Program Frequency:**
“Facilities are currently prioritized for surveys based upon the potential for fugitive emissions to occur, and annual optical gas imaging surveys are established as the baseline for our facilities. Some facilities have been identified as having a higher potential for emissions (and are surveyed at a semi-annual or quarterly frequency.”
- **Discloses Method(s) Used to Estimate Methane Emissions:**
“Pioneer uses EPA reporting requirements due to their specific reporting assumptions, source category equipment, engineering calculations and emission factors.”

RANGE RESOURCES

- **Methane Rate:**
2016 CH₄ Emissions CFE/Production CFE = 0.00052364 (This emission calculation includes both reported and non-reported CH₄ emissions. The EPA requires that only basins with CH₄ emission in excess of 25,000 metric tons/year be reported)⁵⁷
- **LDAR Methodology/Use:**
“Once operation begins, facilities are tested with an optical gas imaging (OGI) camera. In order to assure consistency, Range employees conduct all leak detection surveys for the company. Range currently operates more than 100 sites with LDAR surveys.”⁵⁸

- **LDAR Frequency:**
“All of Range’s well sites that were completed after September 18, 2015 are required to have an LDAR survey under the Federal New Source Performance Standards. For sites with new wells, LDAR surveys are conducted within 60 days of being turned on and semiannual follow-up surveys are performed thereafter.”⁵⁹
- **Replacement of Pneumatic Controllers:**
In 2016, Range reported zero high-bleed controllers in Pennsylvania and North Louisiana.⁶⁰
- **Discloses Method(s) Used to Estimate Methane Emissions:**
 - “Range determines emissions by utilizing a combination of parametric monitoring, engineering calculations, and utilizing generally accepted modeling (simulation). Direct measurement of methane emissions is difficult since emissions are not always occurring in a predictable or measurable location.”⁶¹
 - Range reported the use of direct measurement to estimate 10-25% of methane emissions in its 2016 CDP response.
- **Reports to CDP:**
Range reported to [CDP](#) in 2016 and declined to participate in 2017.

ROYAL DUTCH SHELL ⁶²

- **Methane Emissions as a Standalone Figure:**
FY2016 Gross Global Scope 1 CH₄ emissions of 3100000 metric tons CO₂e reported to CDP.
- **Methane Rate:**
2016 estimated methane emission rate for North American shale operations was less than 0.25%
- **Participates in Voluntary Initiatives:**
EPA Natural Gas STAR Program, API Environmental Partnership, CRSD, Climate and Clean Air Coalition (CCAC) Oil and Gas Methane Partnership, Oil and Gas Climate Initiative (OGCI)

- **Position on Methane-Related Regulations:**
Corporate position on USA Renewable Fuel Standard – Methane Regulations: Support (CDP)
- **LDAR Methodology/LDAR Use:**
LDAR program uses optical gas imaging (OGI) technology. The program has six phases, which are systematically followed across USA shales sites.
- **LDAR Scope:**
“We also conduct on-going auditory, visual and olfactory (AVO) checks across all sites [North America] during routine on-site inspections.”
- **LDAR Frequency:**
“Shell is committed to evidence-based leak detection, which we perform at a frequency at or above regulatory requirements. The majority of operating sites with surface equipment are monitored on an annual basis.”
- **Replacement of Pneumatic Controllers:**
“We have a small remaining inventory of high-bleed controllers, many of which we have inherited as a result of mergers and acquisitions. We are committed to upgrading all the remaining high-bleed controllers on our shales sites with low-emission alternatives within the next five years.”
- **Discloses Method(s) Used to Estimate Methane Emissions:**
“Shell estimates methane emissions based on a combination of emission factors, engineering estimates, mass balance and direct measurements.”
- **Reports to CDP:**
Reported to [CDP](#) in 2017. Did not complete OG module.

SENECA RESOURCES (NATIONAL FUEL)

- **Participates in Voluntary Initiatives:**
EPA Natural Gas STAR Program

- **LDAR Methodology/Use:**
An element of Seneca’s GHG emissions control program includes the use of ultrasonic and infrared methane detection devices as well as “extensive programs to conduct Leak Detection and Repair Surveys.”⁶³

SOUTHWESTERN

- **Methane Emissions as a Standalone Figure:**
35.10 gigagrams of methane emitted in 2016⁶⁴
- **Methane Emissions Rate:**
Methane Leak/Loss Rate of .0175 in 2016⁶⁵
- **Methane Target:**
ONE Future member
- **Participates in Voluntary Initiatives:**
Joined ONE Future in response to ICCR member engagement; EPA Natural Gas Star Program, Climate and Clean Air Coalition (CCAC) Oil and Gas Methane Partnership
- **LDAR Frequency/Methodology/Use:**
The LDAR program includes annual instrument surveys using optical gas imaging cameras or laser-based analyzers.⁶⁶
- **LDAR Scope:**
“In 2016, SWN staff conducted instrument leak detection surveys on 99.9 percent of our total well count and 97 percent of our Midstream-operated compressor stations and repaired the leaks identified.”⁶⁷
- **Replacement of Pneumatic Controllers:**
SWN uses intermittent-bleed pneumatic controllers to minimize emissions.⁶⁸
- **Uses Direct Measurement or Company Specific Emissions Factors:**
“We also utilize Bacharach Hi-Flow measurement devices to quantify the emissions detected.”⁶⁹

APPENDIX A: SCORING CRITERIA

Companies receive credit for “Participates in Voluntary Initiatives” for involvement in initiatives such as the EPA Natural Gas STAR program, the ONE Future Coalition or the Climate and Clean Air Coalition (CCAC) Oil and Gas Methane Partnership. Companies do not receive credit for participation in the American Petroleum Institute’s Environmental Partnership.

To receive credit for “Reports LDAR Program Scope” companies must disclose the percentage of assets covered by the LDAR program (e.g. 11% of Devon Energy’s U.S. facilities received surveys in 2016) or the range of facilities surveyed (e.g. Antero Resources implemented its LDAR program across all areas of operations in West Virginia and Ohio). Generic descriptions that fail to provide investors with enough information on LDAR program scope do not receive credit, such as stating the “majority” of facilities in the U.S. are inspected.

For “Reports LDAR Frequency” the companies must indicate how often LDAR is conducted (e.g. quarterly, annually, semi-annually). Companies do not receive credit for stating LDAR monitoring is conducted as part of routine operations.

All companies that are given credit for the “Reports a Quantitative Methane Goal” metric have adopted methane-specific targets, except for two companies, ConocoPhillips and Devon Energy. These two companies adopted general greenhouse gas reduction targets that incorporate methane emissions.

Companies receive credit for “Uses Direct Detection and Measurement or Company Specific Emissions Factors” only if the company reports the use of direct measurement techniques to calculate methane emissions. Companies that participate in or contribute to scientific studies related to direct measurement do not receive credit. ICCR consulted with EDF and selected this metric based on guidance from their staff.

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- ²⁵ Ibid
- ²⁶ Chevron. (2018). Greenhouse Gas Management. <https://www.chevron.com/corporate-responsibility/climate-change/greenhouse-gas-management>
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