

The Next Frontier

Managing Methane Risk from Non-Operated Assets

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About the Report

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About Environmental Defense Fund

Environmental Defense Fund (EDF) is one of the world's largest environmental nonprofit organizations, with more than two million members and a global staff of over 700 scientists, economists, policy experts and other professionals. EDF finds practical and lasting solutions to the most serious environmental problems. Working with businesses, scientists and academics, EDF takes a leading role in minimizing the environmental and health risks associated with the development of oil and natural gas globally.

About the Approach

EDF analyzed the portfolios of oil and gas companies that meet the following criteria:

1. A publicly traded company¹
2. Member of the Oil and Gas Climate Initiative ²

The eight companies that meet these criteria are:

BP, Chevron, Eni,
ExxonMobil, Occidental,
Repsol, Shell and Total.

Our analysis was limited to publicly traded companies because they are largely owned by non-governmental stakeholders, creating opportunity for external influence. National Oil Companies (NOCs), in contrast, are typically aligned with governmental

interests and priorities. Though Equinor (formerly Statoil) is publicly traded, and a leader in methane reduction, its majority shareholder (67%) is the Norwegian government. For the purposes of this paper, Equinor is treated as an NOC and is therefore excluded from the analysis.

Using data from the Rystad Energy UCube Database, EDF conducted quantitative analysis on the portfolios of these companies. All data is from 2017, and was compiled in August 2018. Furthermore, EDF analyzed the methane management of these companies and select partners by looking at publicly available sources including company websites, sustainability reports, annual reports and CDP disclosures.

EDF defines a non-operated asset for a company as any asset that is not operated by that company. Therefore, an asset operated by an operating company (OPCO) is considered

1. [“Our Shareholders.”](#) Equinor, 2018

2. The Oil and Gas Climate Initiative (OGCI) is a voluntary, CEO-led initiative which aims to lead the industry response to climate change. In September 2018, OGCI announced a methane target, committing to reduce emissions from oil and gas assets to 0.25% of production by 2025.

non-operated, regardless EDF defines a non-operated asset for a company as any asset that is not operated by that company. Therefore, an asset operated by a JV operating company (JV OPCO) is considered non-operated, regardless of whether the company in question is a lead partner of the JV OPCO or has dedicated personnel seconded to the JV OPCO. EDF made this designation due to the complexity and lack of publicly available information regarding JV OPCOs. We recognize that some companies may consider assets operated by JV OPCOs as operated assets. This means that EDF numbers may differ from a company's internal numbers. We encourage greater data and transparency on JV OPCOs to enhance public understanding of HSE management at these assets.

EDF strives to ensure the highest levels of accuracy in our research. If you notice any mistakes or omissions, please let us know so we can correct our error.

Glossary

Barrels of oil equivalent (BOE): a unit of energy equivalent to the amount of energy found in a barrel of oil

Equity reporting: the reporting of information (financial, environmental, etc.) across assets where a company is a shareholder

Health, safety and environment (HSE): a set of practices designed and implemented by a company meant to prevent incidents or injuries related to employees or the environment

International oil company (IOC): a publicly traded oil and gas company with international operations

Joint venture (JV): a business entity created by two or more parties, generally characterized by shared ownership, shared returns and risks, and shared governance

Joint venture operating company (JV OPCO): a company that is established by the formation of an oil and gas joint venture to lead the operations of an asset

Methane Guiding Principles: a set of five principles signed by members of the oil and gas industry that commits signatories to reduce methane emissions across the natural gas value chain

National oil company (NOC): an oil and gas company that is majority-owned by the government

Net present value (NPV): a measurement of profit that is calculated by subtracting the present value of cash outflows from the present value of cash inflows over a period of time

Non-operated asset (NOA): an asset at which another oil and gas company assumes the role of asset operator, overseeing all decision-making and standards

Non-operating partner (NOP): a company that holds a share of an asset but is not the operator

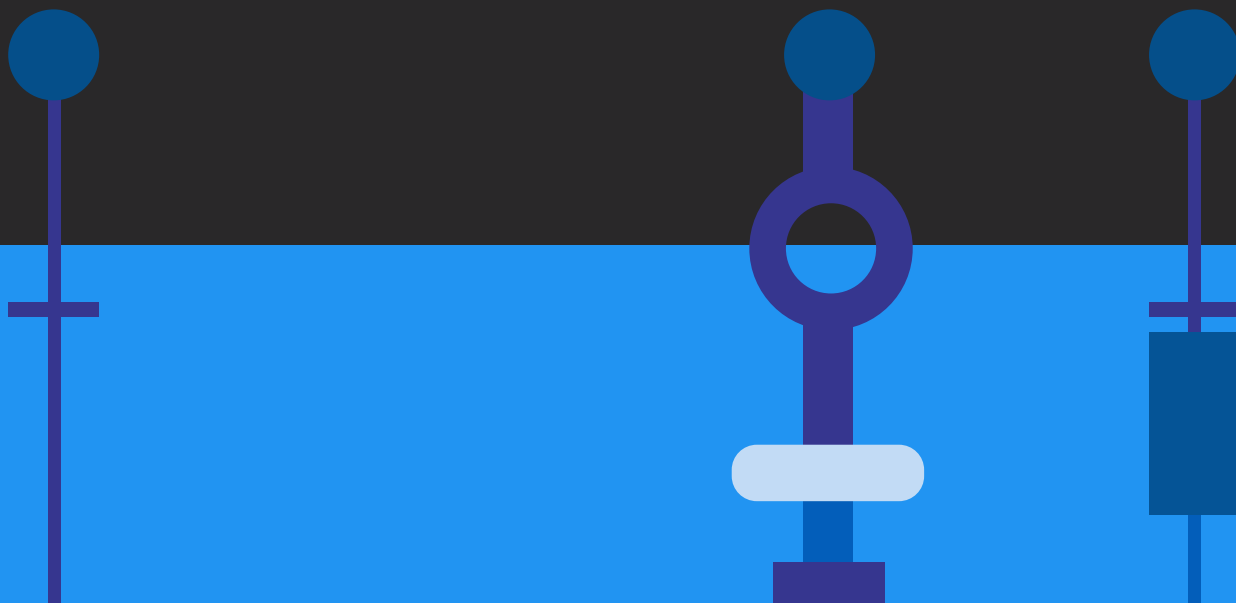
Operated asset: an asset where a company's employees and directly managed contractors are on the ground using the company's standards for processes, tools, and systems

Operating model: the various governance mechanisms through which oil and gas assets are managed

Operational reporting: the reporting of information (financial, environmental, etc.) across assets where a company is the operator

Oil and Gas Climate Initiative (OGCI): a voluntary, CEO-led initiative with 13 member companies, which aims to lead the industry response to climate change

Executive Summary



Executive Summary

Methane emissions pose a fundamental challenge to the oil and gas industry, drawing increasing attention from investors, policy makers and the public. A potent greenhouse gas (GHG), methane is responsible for one-quarter of the warming we are experiencing today. The oil and gas industry is one of the largest manmade sources. Addressing this challenge, however, is both technologically and economically feasible. The International Energy Agency, for example, has found that industry can cut emissions by 75%.

Industry commitments to reduce methane emissions have accelerated in recent years, with companies taking action to lower emissions. In 2018, BP, ExxonMobil and Shell announced individual methane targets. In September, the 13 members of the Oil and Gas Climate Initiative committed to a collective target to reduce methane emissions from their oil and gas operations to 0.25% of production by 2025, with an ambition of 0.20%.

These commitments are significant as leaders in industry seek to manage

risk and demonstrate the role of gas in a lower-carbon world. However, for industry's collective response to the methane challenge to have sufficient impact, it must take on the full scope of the problem. As Environmental Defense Fund (EDF) identified in "Taking Aim: Hitting the Mark on Oil and Gas Methane Targets" from April 2018, a credible methane management strategy must address both operated and non-operated assets, where another oil and gas company assumes responsibility for operations at an asset. Our research and analysis of non-operated assets reveals that:

- The percentage of non-operated production from the companies analyzed in this paper (BP, Chevron, Eni, ExxonMobil, Occidental, Repsol, Shell and Total) ranges from 26% up to 65%.
- The total non-operated production of the companies analyzed represents 20% of global oil and gas production.
- Despite the fact that non-operated assets comprise — on average — over

40% of company portfolios, only 1% of their workforce is tasked to manage them.³

Experts have started to recognize the need for improved Health, Safety & Environment (HSE) management of non-operated assets. After the 2010 Macondo blowout, a former Managing Director at energy investment bank Tudor Pickering Holt & Co stated, “I think the industry will have to change as far as how joint operating partnerships work.”⁴ Going forward, companies should devise strategies to reduce methane emissions at non-operated assets – as a complement to existing commitments – for the following reasons:

1. Comprehensive action needed to support the future role of gas.

Unless industry’s overall methane emissions are minimized, the role of natural gas in a low-carbon economy is imperiled. For industry’s collective response to the methane challenge to be effective, companies should leverage all opportunities available to scale methane reductions.

2. Company reputations are at risk.

As stakeholders scrutinize carbon footprints, advances in aerial and satellite monitoring will provide unprecedented visibility into higher emitting projects and geographies. Even if a company’s boots are not on the ground, its reputation could be at risk by association, putting a premium on preemptive engagement with operating partners.

3. Project partners may be held liable.

Methane incidents such as the Aliso Canyon leak demonstrate that companies can incur financial liability for poor methane management, while post-Macondo, experts recognize potential non-operator liability from HSE events.

3. Kwicinski, Joshua. “Raising the Bar on Non-Operated Joint Venture Influencing.” Water Street Partners, 12 Dec. 2017

4. DuBois, Shelley. “Anadarko: \$6 Billion on the Hook for BP’s Blowout.” CNNMoney, CNN, 18 June 2010

Managing methane emissions from non-operated assets will need to be a collaborative process that unfolds over time. The companies analyzed in this paper are well-positioned to catalyze change by leveraging their network of relationships and technological expertise. As oil and gas companies design and implement strategies to manage methane emissions from non-operated assets, EDF recommends three initial actions:

1. Identify key partners.

A significant portion of non-operated production from these eight companies is concentrated within a few key assets and partners. Methane leaders can prioritize addressing methane with key assets and partners that currently lack methane management.

2. Leverage joint ventures.

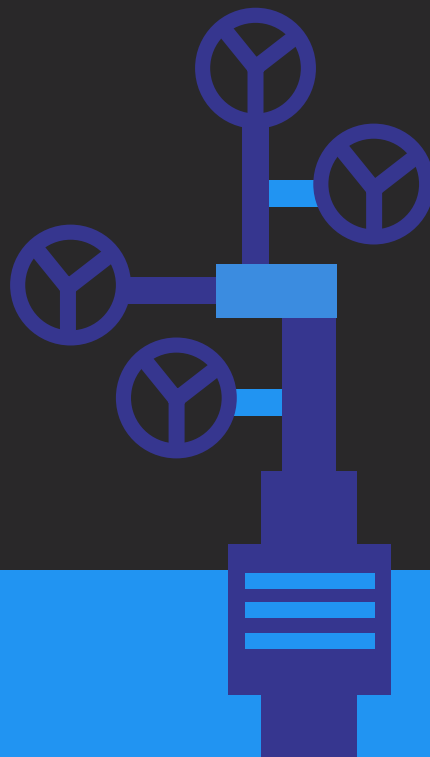
Companies can engage their joint venture experts to understand how they can harness these existing structures to extend the coverage of commitments and improve methane management at non-operated assets.

3. Gather data and information.

Managing methane risk from non-operated assets will require additional data and information regarding emissions and approaches to monitor and reduce them. To devise an actionable methane reduction plan for non-operated assets, companies can start by assessing data availability and gaps.

Through this paper, EDF highlights non-operated assets as an essential next step for leaders in the industry to expand the coverage of their efforts and assure a more comprehensive and effective industry response to emissions.

Introduction



Introduction

In the last five years, many of the largest publicly traded oil and gas companies, along with several state-owned producers, have proactively confronted the methane challenge by making reduction commitments. While the commitments vary, industry leaders are generally setting time-bound, quantitative methane reduction targets that can be met through a combination of equipment upgrades, facility design optimization, workforce training and technology deployment.

To date, all of the initial commitments are limited to the assets the company directly operates (referred to here as “operated assets”). In November 2017, however, eight oil and gas companies committed to a series of methane Guiding Principles⁵ for reducing emissions from operated assets. While the Guiding Principles focus on “identified sources in our

existing operated assets,” signatories “encourage these actions in non-operated assets” and “through industry partnerships, trade associations and proactive stakeholder engagement ... work to help improve approaches to and the application of robust methane emissions management.”⁶

More recently, the thirteen member companies of the Oil and Gas Climate Initiative (OGCI)⁷ announced a joint methane reduction target, committing to reduce methane emissions from oil and gas assets that they operate to 0.25% of marketed gas by 2025.⁸ This target demonstrates a commitment to addressing methane emissions across a coalition with global reach. OGCI member companies are the operating partner for approximately 30% of global oil and gas production, and are active in more than 130 countries.

5. Original Guiding Principles industry signatories: BP, Statoil, Eni, Shell, ExxonMobil, Total, Repsol, Wintershall

6. Reducing Methane Emissions across the Natural Gas Value Chain – Guiding Principles.” [Climate and Clean Air Coalition, 2017](#)

7. Oil and Gas Climate Initiative signatories: Equinor, PEMEX, Shell, Saudi Aramco, Eni, Repsol, BP, CNPC, Petrobras, Total, ExxonMobil, Chevron, Occidental Petroleum

8. “[Oil and Gas Climate Initiative Sets First Collective Methane Target for Member Companies.](#)” OGCI, 24 Sept. 2018

This commitment, however, leaves out a significant share of the companies' portfolios. For methane commitments to achieve the reduction levels necessary to sufficiently mitigate reputational and business risk, companies ultimately must expand the coverage of their efforts, making them comprehensive and inclusive of non-operated assets.

OGCI member companies are non-operating partners on 17% of global production. Across these assets, OGCI members have a significant equity share. For example, OGCI

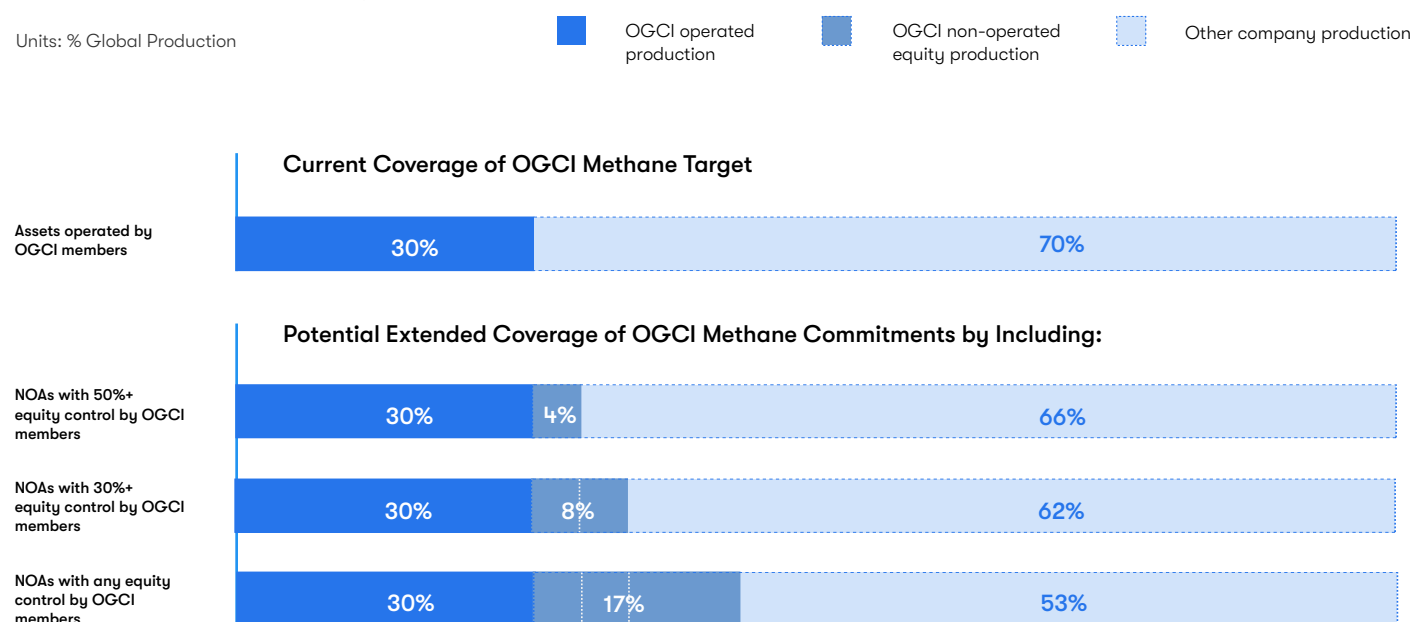
member companies are the majority shareholders (>50%) on 4% of global production. Furthermore, approximately one-third of these non-operated assets (NOAs) have more than one OGCI member company as a non-operating partner.

Assets with an OGCI member as a JV partner, operator or non-operator, account for almost half of global oil and gas production.

FIGURE 1

Global Production Covered by OGCI Methane Target

Units: % Global Production



Source: Rystad Energy, 2018

Global oil and gas companies each own a portfolio of assets. Some of these are operated assets, where company employees and directly managed contractors are on the ground using the company's standards. Portfolios also include non-operated assets, wherein another oil and gas company assumes the role of asset operator.

These non-operated assets account for 26% to 65% of the total production owned by the eight publicly-traded OGCI companies that currently lead the industry in methane focus. Such assets can present a liability if overlooked. Conversely, they represent a significant opportunity for global methane leaders to increase the coverage and potential impact of their reduction efforts. Indeed, we estimate that if companies were to expand their methane reduction strategies to include an approach for non-operated assets, they increase the coverage of their methane commitments by three- to five-fold.

The companies that are demonstrating leadership at their operated assets are also well-positioned to catalyze action at non-operated assets, where their

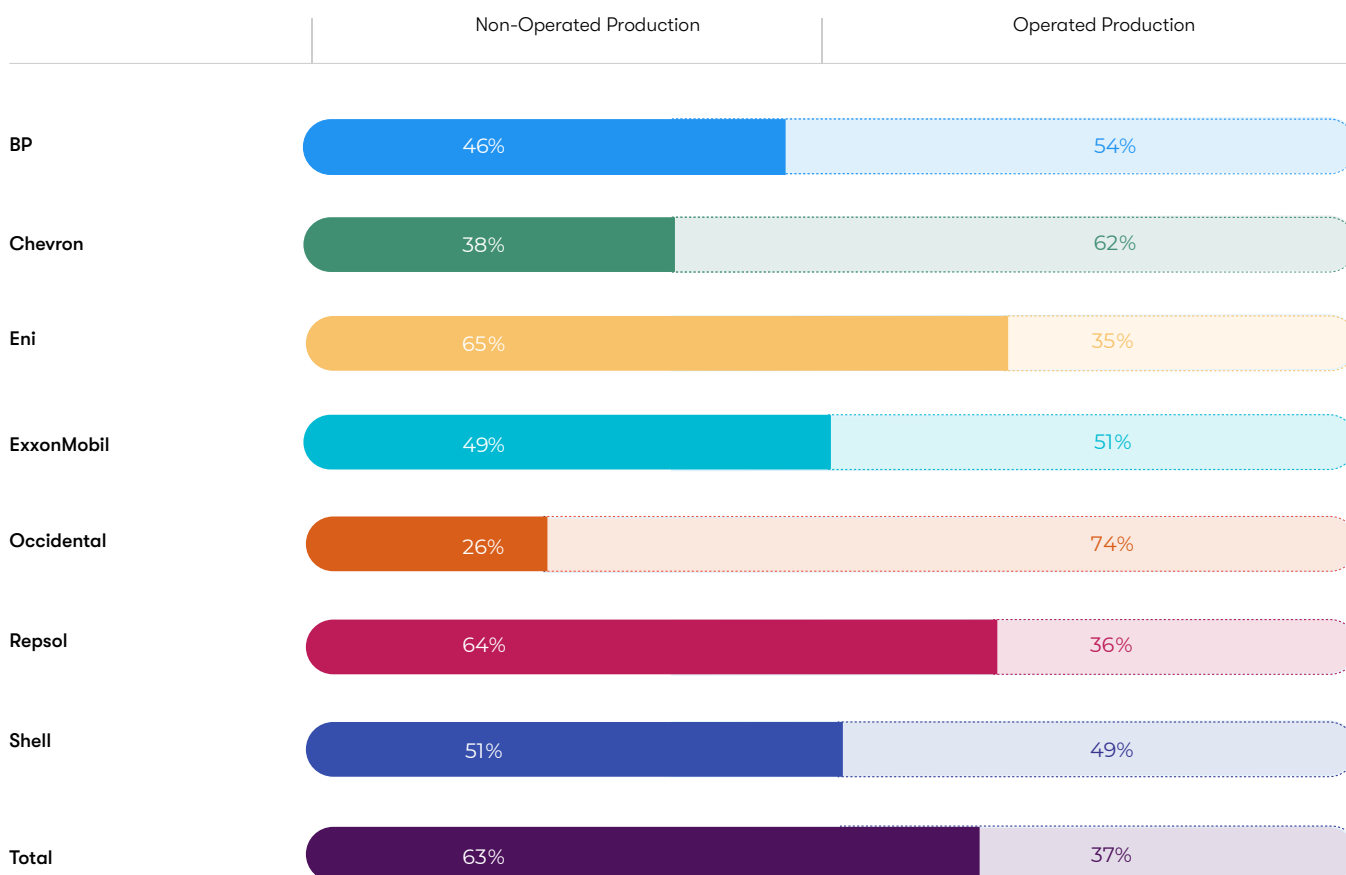
equity stake and existing relationships with asset operators can create opportunity for influencing others in industry. These partnerships may provide the best avenue for galvanizing change in diverse geographies around the world.

Across the publicly traded companies in OGCI, the scale of non-operated assets is significant. **By weighted average, over half the assets owned by the publicly traded companies in OGCI are operated by a different company.**

Therefore, to estimate the coverage of an “operated-only” methane reduction strategy, one can cut the production footprint of these companies by half.

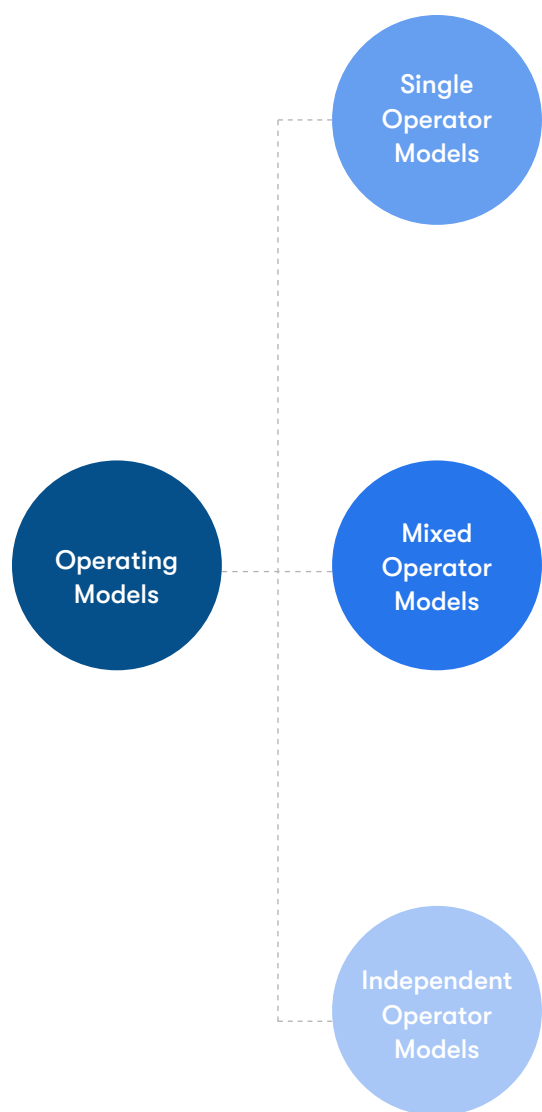
FIGURE 2

Operated versus Non-Operated Asset Production Portfolio Across Publicly Traded OGCI Members



Non-operated assets are commonly governed through a joint venture (JV), where two or more companies enter into a formal business agreement to execute an oil and gas project. Each

joint venture is structured differently, and operating models vary widely between projects. In general, there are three types of JV operating models⁹:



Single operator: One partner in the joint venture is designated the operator and conducts day-to-day operations.

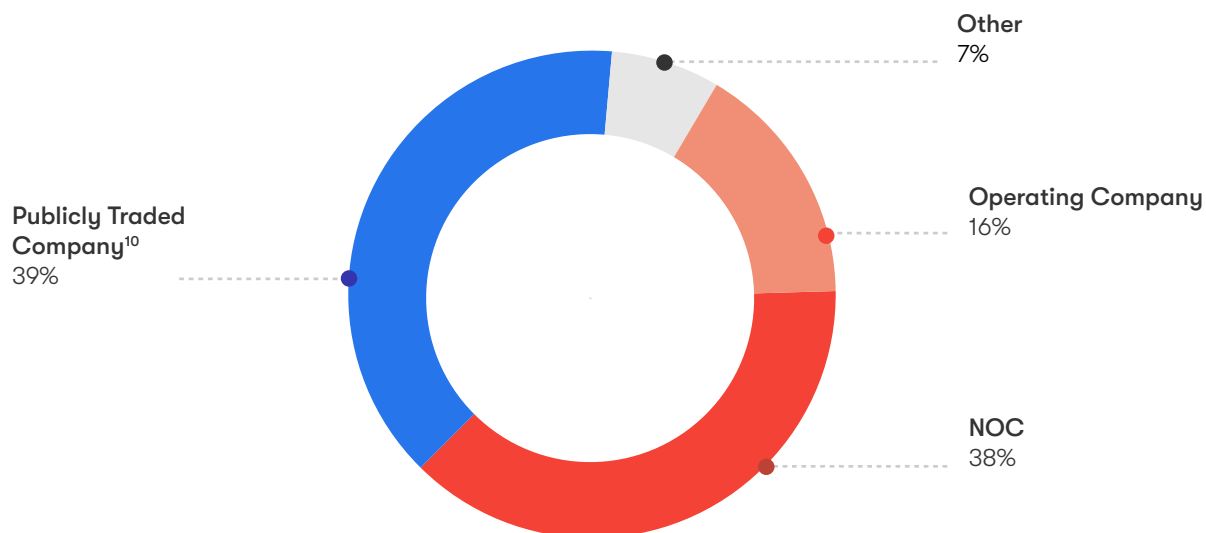
Mixed operator: Two or more joint venture partners assume ownership of specific responsibilities, creating a division of labor or joint operations.

Independent operator: An incorporated entity is formed by the JV partners to develop and manage the asset.

9. Water Street Partners, 2018

FIGURE 3

Global Production by Operator Type



10. Publicly traded companies include the companies that Rystad designates as major, integrated, E&P companies, exploration company and industrial.

Source: Rystad Energy, 2018

What is a Joint Venture Operating Company?

A JV Operating Company (JV OPCO) is an incorporated entity with varying levels of autonomy, depending on the underlying legal agreement. Some JV OPCOs may have their own HSE practices, while others may follow the standards of a shareholder. In countries with an NOC, JV OPCOs are commonly formed to govern joint

ventures with IOC partners. As a result, there are numerous, nominally independent enterprises across the global oil and gas ecosystem that may not disclose methane emissions data in a manner consistent with the higher standards of some JV OPCO partners.

Non-operated assets are an opportunity for improved emissions performance, but also a risk. “While major energy & production companies may employ rigorous systems for managing risks in their own operations, until recently they have largely maintained a ‘hands-off’ approach with their non-operated joint ventures.”¹¹ Non-Operator Partners (NOPs) have been held accountable for incidents at assets they do not directly control, making risk management for non-operated assets all the more important going forward. For example, in 2015 the NOPs in Macondo, Anadarko Petroleum and Moex Offshore (a subsidiary of Mitsui & Co.), paid nearly \$160 and \$90 million respectively in fines for their roles as part owners in the 2010 Gulf of Mexico incident.¹² In addition, Anadarko’s share price dropped right after Macondo, resulting in an estimated \$10 billion dollar loss, or 20% reduction in market capitalization.¹³

These fines sent two important accountability signals to joint venture partners. First, all partners, regardless of operatorship, can be held liable.

Second, that NOPs cannot expect absolvment from the reputational damage and risk exposure incurred from HSE events at non-operated assets. After the Macondo blowout, a former Managing Director at energy investment bank Tudor Pickering Holt & Co stated, “I think the industry will have to change as far as how joint operating partnerships work.”¹⁴

As leaders in the oil and gas industry confront methane risk and drive down emissions to realize their commitments, there are two primary reasons why a strategy should be developed to manage methane at both operated and non-operated assets.

Non-operated assets can maximize the impact of methane commitments.

Leaders in the the global oil and gas industry recognize the challenge that methane poses to the long-term role of natural gas. According to the International Energy Agency, “the role that natural gas can play in the future of global energy is inextricably linked to its ability to help address environmental problems.”¹⁵ Omitting, in some cases, over half of portfolios

11. Zamora, Tony. Risk At Arms Length: How Exploration And Production Companies Are Managing Risks In Non-Operated Joint Ventures. Society of Petroleum Engineers, 11 Apr. 2016

12. “Anadarko to Pay \$159.5 Million for Macondo Incident.” Offshore, 1 Dec. 2015

13. Gelsi, Steve. “Anadarko, Mitsui Refuse to Reimburse for Spill Costs: BP.” MarketWatch, MarketWatch, 14 July 2010

14. Gelsi, Steve. “Anadarko, Mitsui Refuse to Reimburse for Spill Costs: BP.” MarketWatch, MarketWatch, 14 July 2010

15. Gould, Tim, and Christophe McGlade. “Commentary: The Environmental Case for Natural Gas.” International Energy Agency, 23 Oct. 2017

from methane reduction strategies could compromise the value of important efforts made by companies at their own operations. As stakeholder demands for cleaner energy ratchet up, comprehensive risk management improves future positioning.

Information spurs awareness, attention and action.

Today, information regarding methane management at non-operated assets varies in substance and transparency. However, with the global proliferation of methane detection and quantification technologies, including methane monitoring satellites, non-operated asset emissions data will become readily available in the years to come. It is in industry's best interest to seize the methane reduction opportunity at non-operated assets before external stakeholders reach their own conclusions using open-access information.

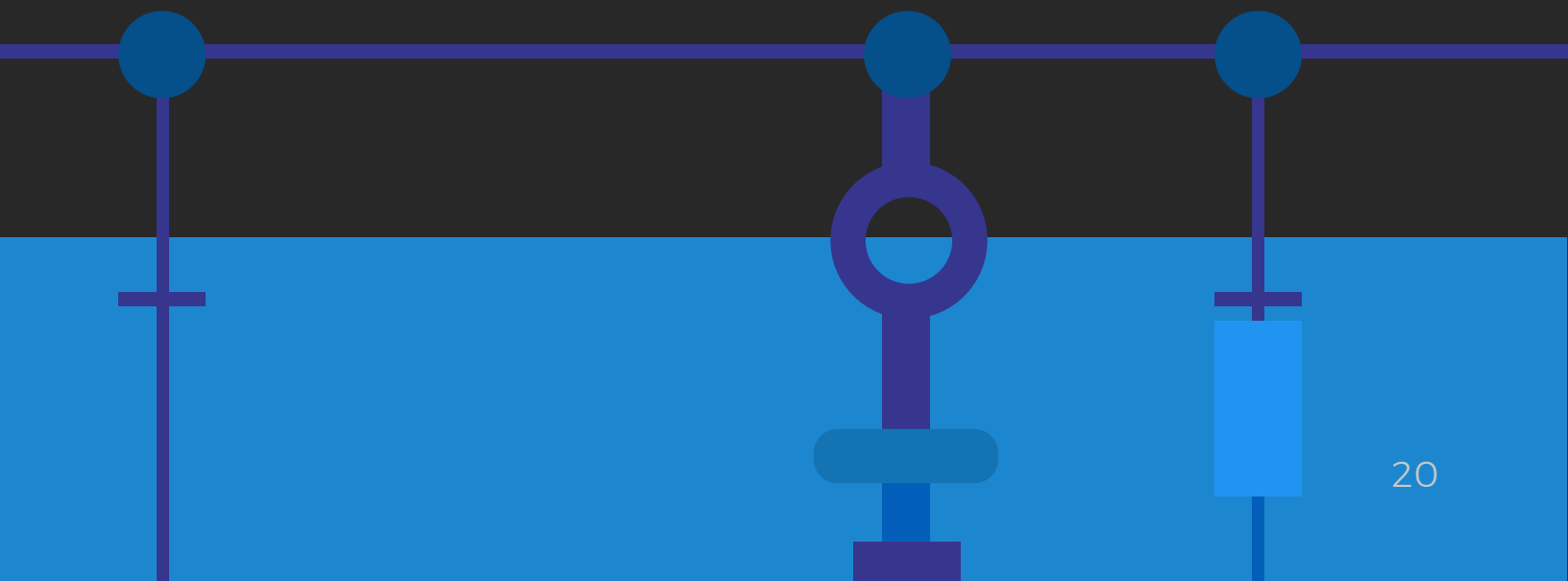
mitigation strategies; and (3) galvanize constructive, multi-stakeholder dialogue on pragmatic solutions for non-operated asset methane management.

The goals of this whitepaper are to (1) assess the outsized impact a selection of publicly-traded companies can have on reducing methane emissions from non-operated assets; (2) demonstrate the risk of non-operated assets to prevailing methane

PART 1

Analysis

‘Non-Operated’ Does
Not Mean ‘Not My Problem’



Analysis

Non-Operated Assets (herein referred to as NOAs) are a paradox for an industry that prioritizes operational excellence and safety.

Despite the fact that NOAs comprise 40%+ of supermajor production, only 1% of their workforce is tasked to manage them.¹⁶

In some instances, NOAs are viewed “as a relatively safe part of [E&P players] portfolios - to the point that they approach them with benign neglect.”¹⁷

Though a significant portion of production comes from NOAs, all industry methane commitments to date focus on operated assets only. The lack of a strategy for non-operated assets in existing methane reduction commitments constitutes a significant gap for leaders in industry.

To demonstrate the size of this opportunity, we analyzed the portfolios of global, upstream oil and gas companies that meet two criteria:

1. A publicly traded company¹⁸
2. Member of the Oil and Gas Climate Initiative

The eight companies that meet these criteria are:

BP, Chevron, Eni,
ExxonMobil, Occidental,
Repsol, Shell and Total.

If these eight companies were to constructively engage joint venture partners to propagate methane management best practices to NOAs, the potential impact could be far reaching and yield action across operators that, to date, have not publicly joined this global effort.

16. Op. Cit.

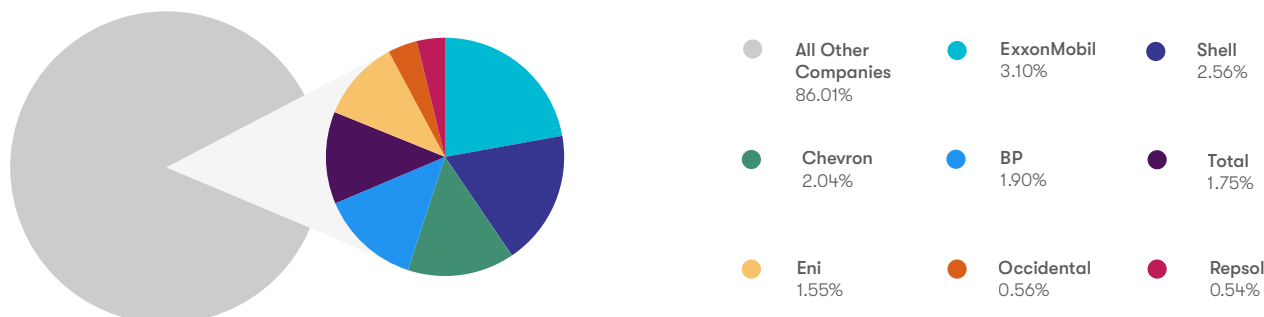
17. Whittaker, Phillip, and Chris Young. Enhancing Value in Non-Operated Oil and Gas Ventures. BCG, 14 Jan. 2013

18. While Equinor is publicly traded, they are majority (67%) owned by the Norwegian government. As a result, they have not been included in this analysis.

FIGURE 4

Percentage of Global Production from Analyzed Companies

Source: Rystad Energy, 2018

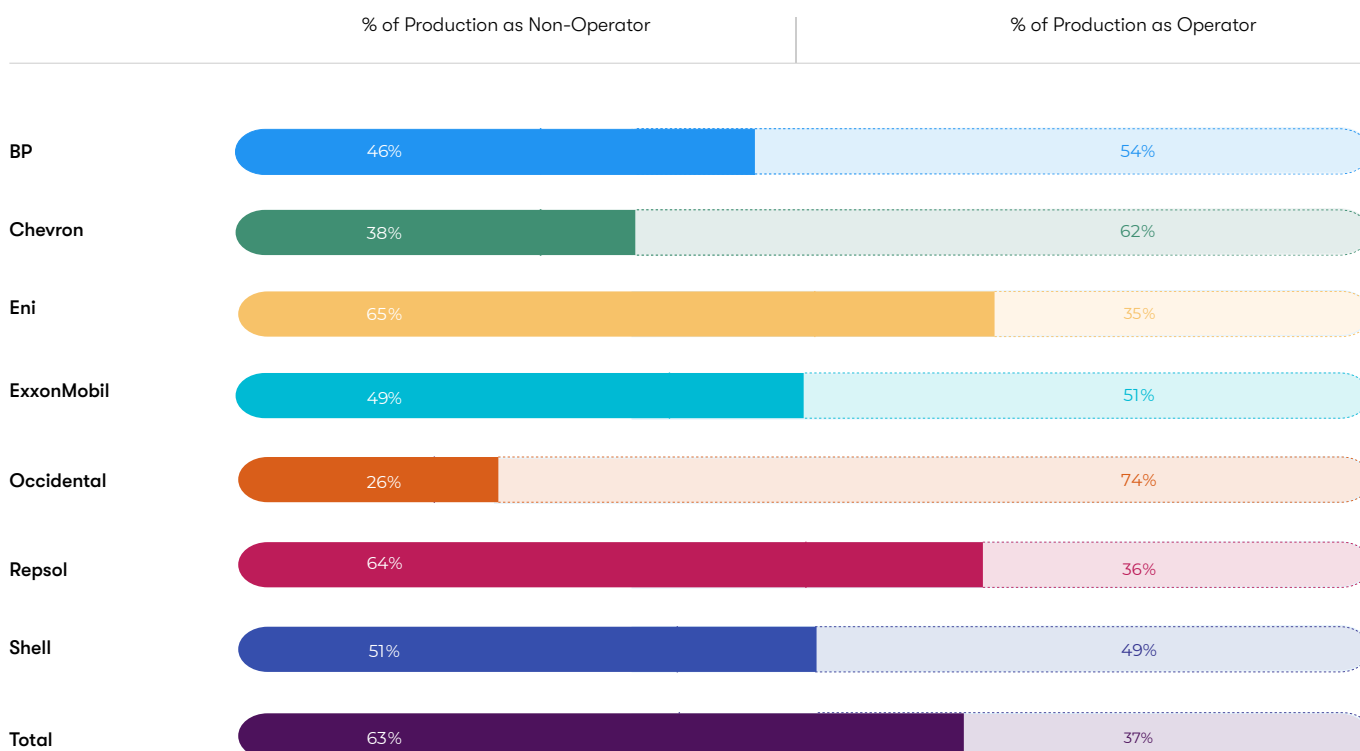


For each of these companies, NOAs account for 25% to 65% of their production.

On a global scale, **20%** of oil and gas production comes from these NOAs.

FIGURE 5

Operated versus Non-Operated Asset Production Portfolio across Analyzed Companies



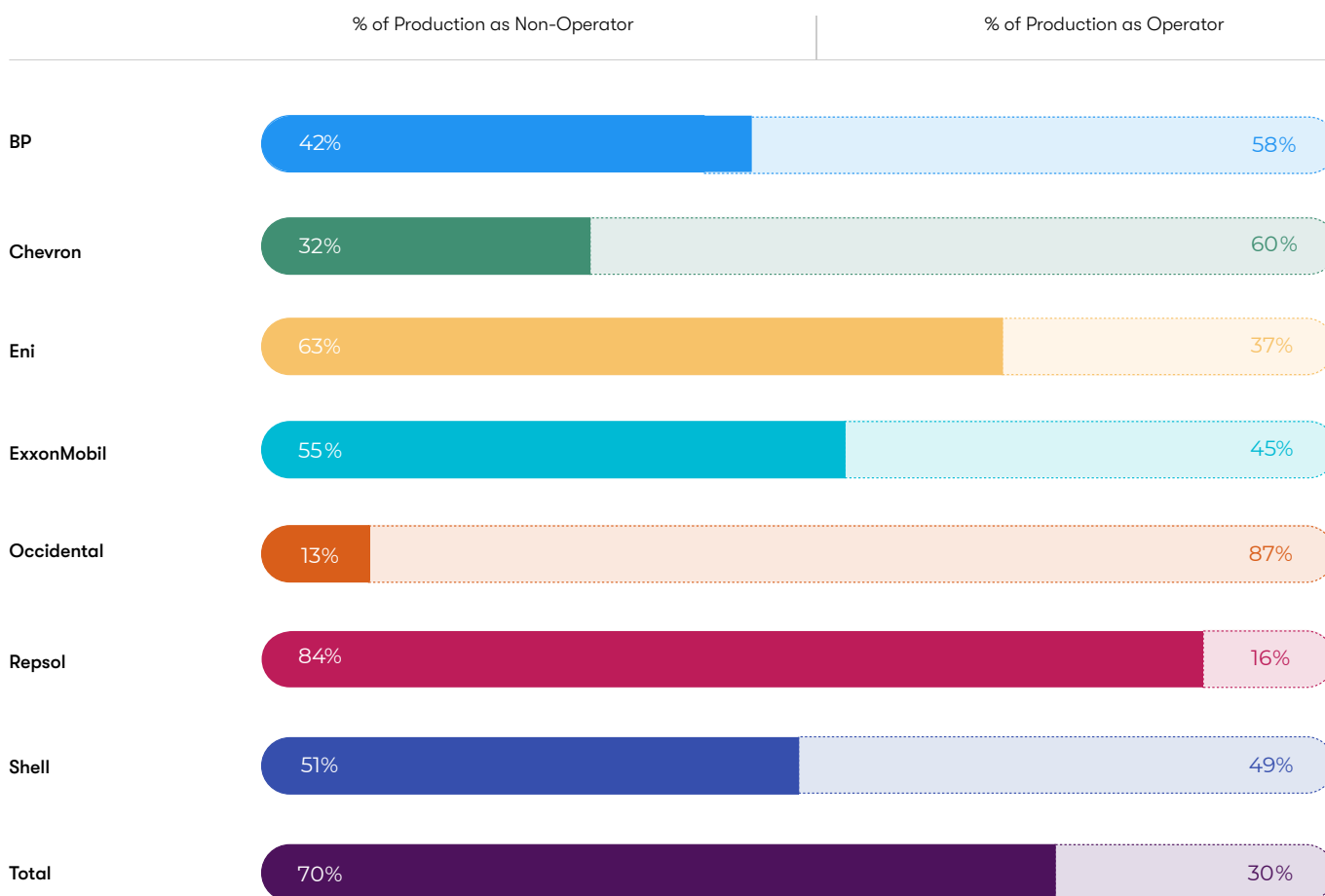
Source: Rystad Energy, 2018

These NOAs are frequently among the largest and most valuable assets in the world. According to best available data from Rystad Energy, on average over 50% of analyzed company net present value (NPV) is derived from non-operated assets. Aggregated

across all eight companies, the figure is staggering: **almost \$550 billion in NPV is non-operated**. This is more than the NPV of all oil and gas projects in Algeria, one of the top producing countries in the world.

FIGURE 6

Operated versus Non-Operated NPV Portfolio across Analyzed Companies

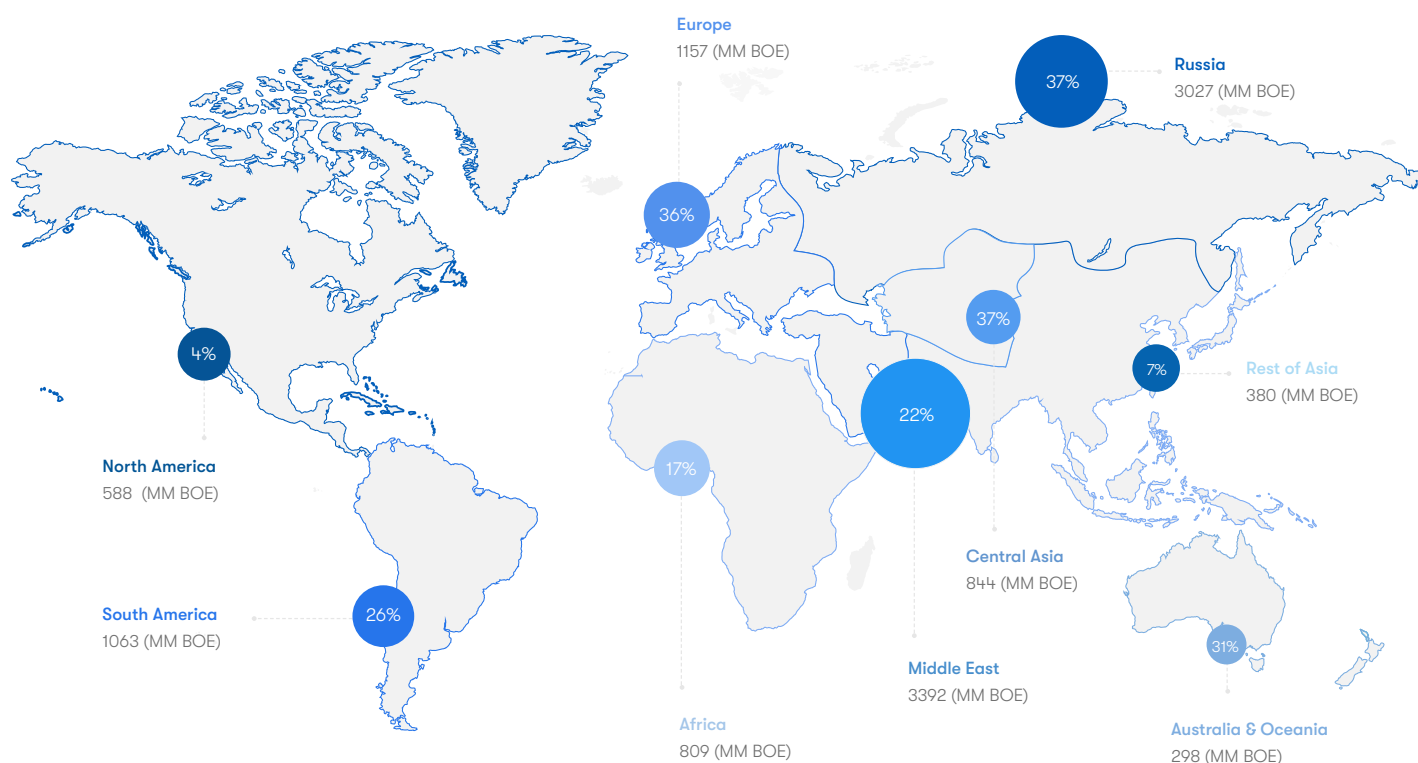


The eight companies have NOAs on every continent. However, almost 70% of their NOA production is located in the Middle East, Russia and Asia. Within these regions, NOA production is concentrated among a few major assets, making potential methane mitigation strategies narrow in scope but high in impact.

The 10 largest NOAs alone account for a quarter of total NOA production from these eight companies, and approximately 5% of total global oil and gas production.

FIGURE 7

Map of Non-Operated Production for Analyzed Companies by Region



Bubbles are scaled to the size of NOA production. The % represents the percentage of regional production from these NOAs.

Priobskoye North, Russia

The largest NOAs for the companies we analyzed are all operated by an NOC or JVOPCO. Historically, IOCs have led the industry on methane reduction commitments. While most IOCs publicly report methane emissions, few NOCs do, and even fewer report a qualitative approach or strategy for methane leak detection and mitigation. As a result, some of the largest NOC-operated assets in the world may not achieve the same methane reductions as those operated by IOC partners.

Understanding where these assets are and who operates them is an important first step for strategic IOC engagement at potentially high-impact NOAs. EDF selected five of the ten largest NOA assets in our analyzed companies' portfolios and reviewed the publicly available methane reporting and strategies of the operator and non-operator partners.

FIGURE 8

Methane Management and Disclosure Practices of Priobskoye Companies

COMPANY ¹⁹	HEADQUARTERS	Publishes a sustainability report	Any mention of methane	Publicly reports any GHG emissions	Reports methane separately	Has a methane target	LDAR program
Rosneft	Russia	✓	✗	✓	✗	✗	✗
BP	UK	✓	✓	✓	✓	✓	✓



NOC



OPCI



IOC



Operators

¹⁹ Only companies with oil and gas operations were included in this analysis. Petoro is also a shareholder on this asset.

Many of the largest NOAs owned by the eight companies analyzed in this paper are in countries with a National Oil Company (NOC). These companies are owned by and closely connected to their respective governments. NOCs, including JV OPCOs co-owned and managed by NOCs, are the most common operating partners for NOAs, operating close to 35% of NOA production for the analyzed companies.

The dominance of NOCs and JV OPCOs as global operators presents a risk and an opportunity to the extended coverage of IOC methane reduction commitments. NOCs are

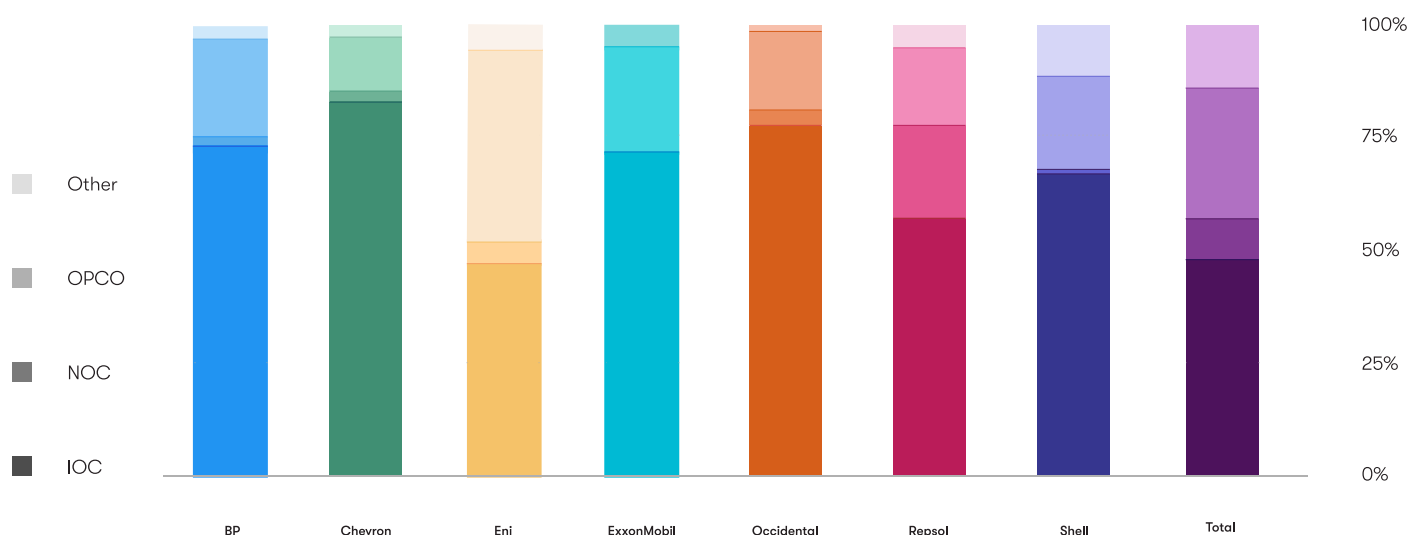
largely owned by the state and are not typically motivated by the same external pressures as IOCs, such as shareholder engagement.

IOCs can play a critical role in raising awareness and advancing methane reduction at NOC-operated assets. As our analysis demonstrates, the majority of the largest NOCs and IOCs have close working relationships through their joint ventures. IOCs that are addressing the methane challenge today, and making ambitious methane commitments, are best positioned to directly influence their NOC joint venture partners in ways other methane influencers may not.

FIGURE 9

Production by Operator Type for Analyzed Companies

Units: % Company Production



Prioritizing joint venture partners with a history of collaboration across multiple assets may be a strategic place to begin engagement.²⁰ While the global joint venture network is complex, the companies analyzed in this report have several key operating partners in common. Companies that work together across many projects likely have developed deep business ties. Understanding the JV network can highlight pathways for companies to influence operating partners.

A strong working relationship may make it easier for companies to engage partners on methane mitigation. Our analysis of the joint venture networks for our select companies reveals that 20% of oil and gas production has one or more of the companies analyzed in this paper as a non-operator partner. Leveraging relationships at some of the largest assets in the world can open doors to vast quantities of production currently out of scope for existing methane commitments.

20. See Appendix: JV Network Maps of Analyzed Companies

Azeri-Chirag-Guneshli

Deep Water, Azerbaijan



FIGURE 10

Methane Management and Disclosure Practices of ACG Deep Water Companies

COMPANY	HEADQUARTERS	Publishes a sustainability report	Any mention of methane	Publicly reports any GHG emissions	Reports methane separately	Has a methane target	LDAR program
AIOC	Azerbaijan	*See note below					
SOCAR	Azerbaijan	✓	✓	✓	✓	✗	✗
Equinor	Norway	✓	✓	✓	✓	✓	✓
ONGC	India	✓	✓	✓	✗	✗	✓
TPAO	Turkey	✗	✗	✗	✗	✗	✗
BP	UK	✓	✓	✓	✓	✓	✓
ExxonMobil	USA	✓	✓	✓	✓	✓	✓
Chevron	USA	✓	✓	✓	✓	✓	✓
Inpex	Japan	✓	✓	✓	✗	✗	✗

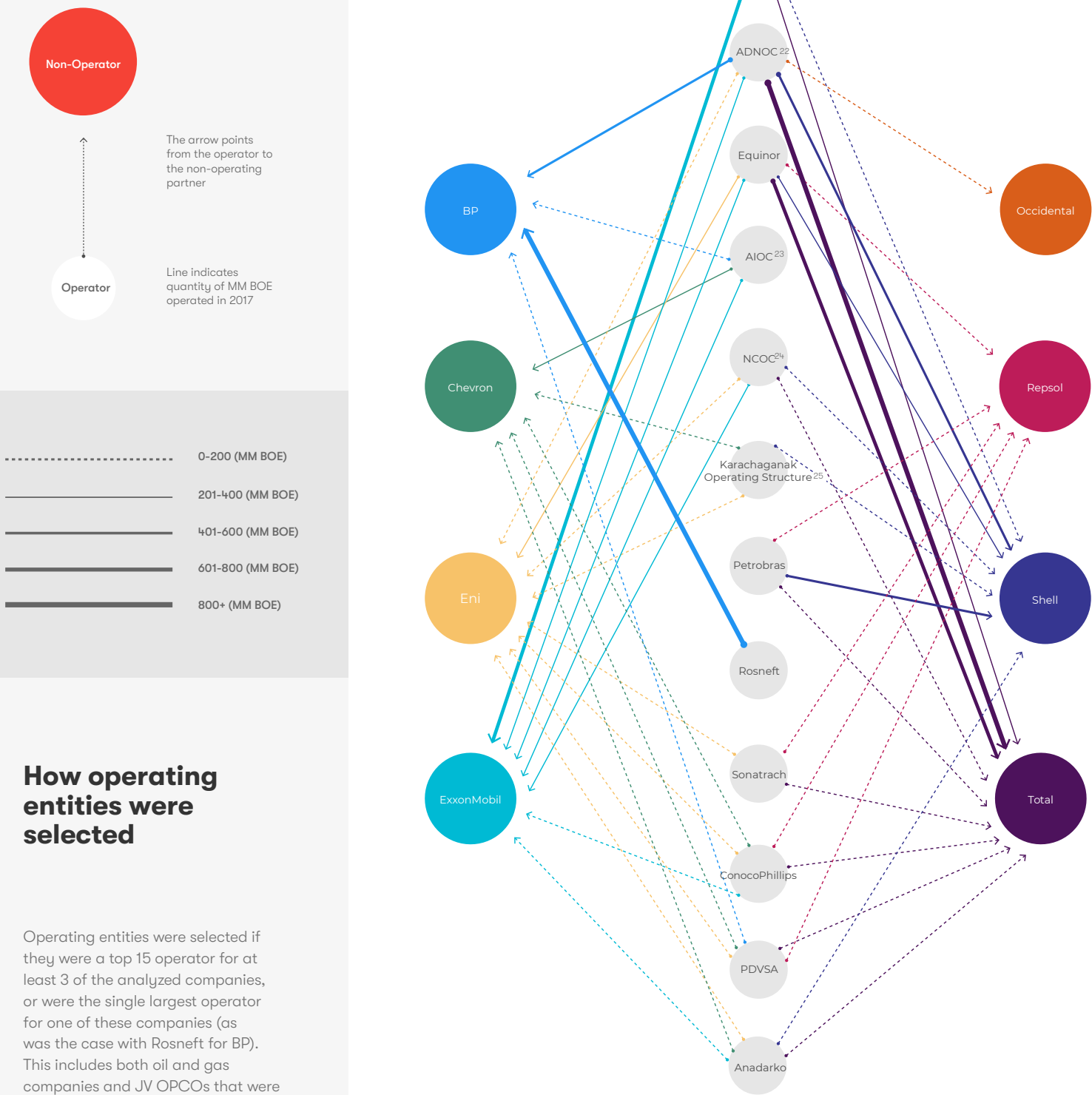
*While incorporated, AIOC has no website of its own. Instead, BP's website states that it operates the asset on behalf of AIOC, a consortium of companies including: BP (30.37%), SOCAR (25%), Chevron (9.57%), Inpex (9.31%), Equinor (7.27%), ExxonMobil (6.79%), TPAO (5.73%), ITOCHU (3.65%), ONGC (2.31%)

AIOC = Azerbaijan International Operating Company
 SOCAR = State Oil Company of Azerbaijan Republic
 ONGC = Oil and Natural Gas Corporation Limited
 TPAO = Türkiye Petrolleri Anonim Ortaklığı

● NOC ● OPCO ● IOC ■ Operators

FIGURE 11

Network of Analyzed Companies and Largest Operating Entities



How operating entities were selected

Operating entities were selected if they were a top 15 operator for at least 3 of the analyzed companies, or were the single largest operator for one of these companies (as was the case with Rosneft for BP). This includes both oil and gas companies and JV OPCOs that were established to manage an asset.

21. QP and ADNOC include JVOPCOs

22. ADNOC = Abu Dhabi National Oil Company

23. AIOC = Azerbaijan International Operating Company

24. NCOC = North Caspian Operating Company

25. Partners: Chevron (18%), Eni (29.3%), Shell (29.3%), KazMunayGaz (10%), Lukoil (13.5%)

BP (30.37%), SOCAR (25%), Chevron (9.57%), Inpex (9.31%), Equinor (7.27%), ExxonMobil (6.79%), TPAO (5.73%), ITOCHU (3.65%), ONGC (2.31%)

Partners: KazMunayGas (16.81%), Eni (16.81%), Shell (16.81%), ExxonMobil (16.81%), Total (16.81%), CNPC (8.4%) and Inpex (7.56%)

BP, Eni, ExxonMobil, and Shell are among the first international oil companies to set quantitative methane targets. Like

the commitments made through OGCI and the Guiding Principles, these targets explicitly apply to operated assets only.

FIGURE 12

Methane Targets of BP, Eni, ExxonMobil and Shell

COMPANY	TARGET
BP	Limit methane emissions from upstream operations to 0.2%
ENI	Reduce fugitive methane emissions by 80% by 2025 compared to 2014
EXXONMOBIL	Reduce methane emissions by 15% by 2020
SHELL	Maintain methane emissions intensity below 0.2% by 2025

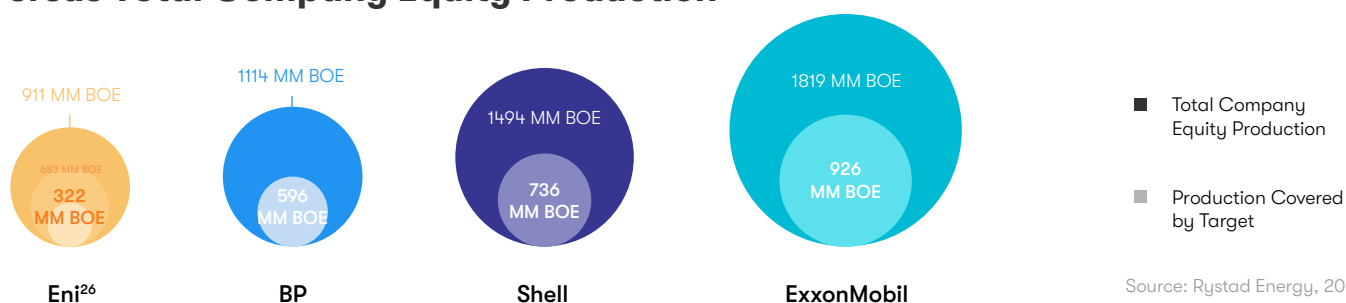
While these commitments are an important demonstration of industry's action to address the methane challenge, current methane reduction goals will exclude, on average, half of each company's production unless they are complemented by a strategy for NOAs.

For example, BP operated 1.3 billion barrels of oil equivalent (BOE) in 2017, or about 2% of global oil and gas production. But in 2017 BP was a partner

on assets that produced over 5.5 billion BOE, or almost 10% of global production. Shell operated 2.5% of global production, but partnered on assets worth almost 8%. Eni and ExxonMobil operated 1% and 3% of global production respectively, but were partners on 5% and 9% of global production. If companies expand their methane reduction strategies to include an approach for engagement at non-operated assets, they increase the coverage of their efforts three- to five-fold.

FIGURE 13

Production Covered by Existing Methane Reduction Commitments versus Total Company Equity Production



Source: Rystad Energy, 2018

26. In its internal calculations, Eni considers assets operated by its JV OPCOs as Eni-operated assets, and thus extends its target to these assets. Calculating Eni's operated production by these standards would mean that Eni operates 683 MM BOE. Thus, Eni's methane target would cover 1.2% of global production as opposed to 1%.

Case Study

Bu Hasa, UAE

China National Petroleum Company (CNPC) is a member of the Oil and Gas Climate Initiative, which announced its joint methane reduction target in September 2018. Through this target, CNPC has committed to “report our collective methane intensity annually on the basis of

transparent reporting rules, methodology and assumptions, with data aggregated by an independent third party.”²⁷ As the company implements OGCI’s commitment to transparency, CNPC can enhance methane disclosure.

FIGURE 14

Methane Management and Disclosure Practices of Bu Hasa Companies

COMPANY	HEADQUARTERS	Publishes a sustainability report	Any mention of methane	Publicly reports any GHG emissions	Reports methane separately	Has a methane target	LDAR program
ADNOC	UAE	✓	✓	✓	✗	✗	✗
CNPC	China	✓	✓	✗	✗	✗	✓
BP	UK	✓	✓	✓	✓	✓	✓
Total	France	✓	✓	✓	✗	✓	✓

ADNOC = Abu Dhabi National Oil Company
CNPC = China National Petroleum Corporation

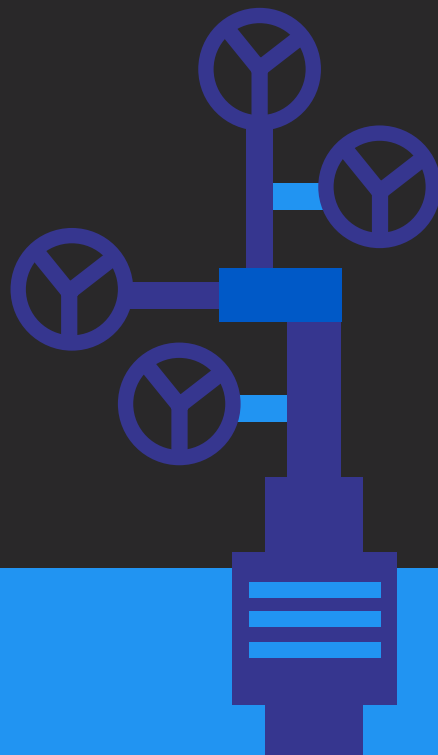
● NOC ● OPCO ● IOC □ Operators

27. At Work: Committed to Climate Action. Oil and Gas Climate Initiative, 2018, p. 28, At Work: Committed to Climate Action. page 28

PART 2

Analysis

Non-Operated Asset
Disclosure: You Cannot
Assess What You Do
Not Know



Analysis

HSE reporting on non-operated assets, especially for methane management, is a complex issue that currently receives limited disclosure. In general, methane disclosure by oil and gas companies has improved notably in the past few years, often at the urging of investors. Investors representing USD \$4.2 trillion assets under management have made improving oil and gas methane disclosure an engagement priority.²⁸ In one recent assessment of 64 publicly traded oil and gas companies, almost 60% provided some disclosure around methane management.²⁹

These disclosures include metrics such as absolute emissions figures, details on leak detection and repair (LDAR) programs and quantitative reduction targets.³⁰ Many of these companies also go beyond basic metrics, providing valuable qualitative narratives on how methane management fits into the company's larger strategy and risk management programs. For instance, Shell reports the oversight and incentive mechanisms its board and senior

management have to reduce methane emissions.³¹

Current reporting on methane management from non-operated assets is limited. While there are strict accounting requirements for financial reporting on joint ventures set by organizations like the Financial Accounting Standards Board and the International Accounting Standards Board, that standardization has not yet crossed over to HSE reporting, especially for methane. For example, only two of the eight companies analyzed in this paper, BP and ExxonMobil, report methane emissions on an equity basis³², meaning the company reports methane emissions associated with all of its economic interests, rather than just operational control. However, some companies are moving in the right direction. Five of the eight companies analyzed in this paper separate equity and operated greenhouse gas emissions, providing initial visibility into the impact of non-operated assets.

28. "PRI Tackles Threat of Methane Emissions with Collaborative Engagement," PRI, 20 Apr. 2017

29. "PRI Tackles Threat of Methane Emissions with Collaborative Engagement," PRI, 20 Apr. 2017

30. Ibid.

31. "Shell Onshore Operating Principles in Action in North America: Methane Fact Sheet," Shell, 2017

32. While both BP and ExxonMobil report equity methane emissions, their respective approaches to reporting differ. BP reports operated and equity emissions separately, meaning they report the entirety of emissions from every asset they operate, in addition to emissions based on equity share at non-operated assets. ExxonMobil reports net equity emissions, meaning that they adjust emissions to reflect their equity share in an asset, even when they are the operator.

Case Study 1

Troll East, Norway



FIGURE 15

Methane Management and Disclosure Practices of Troll East Companies

COMPANY	HEADQUARTERS	Publishes a sustainability report	Any mention of methane	Publicly reports any GHG emissions	Reports methane separately	Has a methane target	LDAR program
Equinor	Norway	✓	✓	✓	✓	✓	✓
Total	France	✓	✓	✓	✓	✓	✓
ConocoPhillips	USA	✓	✓	✓	✓	✗	✓
Shell	The Netherlands	✓	✓	✓	✓	✓	✓



NOC



OPCO



IOC



Operators

By starting to report qualitatively on methane management at non-operated assets in the near-term, companies can show progress on transparency, while on a longer-term pathway to developing the quantitative disclosure that investors and others will request in the future.

FIGURE 16

Emissions Reporting of Analyzed Companies

COMPANY	Reports equity emissions	Separates equity and operated emissions	Separates equity methane emissions from equity CO ₂ e emissions
BP	✓	✓	✓
CHEVRON	✓	✓	×
ENI	×	×	×
EXXONMOBIL	✓	×	✓
OCCIDENTAL	×	×	×
REPSOL	×	×	×
SHELL	✓	✓	×
TOTAL	✓	✓	×

Qualitative methane management disclosure at NOAs is also scarce.

Some companies are beginning to address this risk, but the details are vague. ConocoPhillips states “A risk analysis item was added to some business unit climate change management plans to determine

whether non-operated assets carry unmitigated risks. Some business units have developed plans to influence non-ConocoPhillips operators on addressing climate change issues. Further work on this subject is expected to continue.”³³

33. “Managing Risks & Opportunities,”
ConocoPhillips, 2018

Disclosing this risk analysis is a positive step and a signal that ConocoPhillips is starting to address this challenge. Going forward, it will be necessary for other companies to share additional details on the impact of influencing at non-operated assets in order to track accountability and commitment to addressing methane emissions across portfolios.

Reporting on NOAs presents a unique set of challenges. The data can be difficult to obtain and verify. In addition, the regulatory requirements vary significantly by geography. Despite these challenges, oil and gas companies that proactively disclose how they engage at non-operated assets will be better positioned to manage growing stakeholder pressure on this topic. Companies should consider qualitative non-operated disclosure as a viable first step to creating enhanced transparency on managing methane risk from these assets.

The Task Force on Climate-related Financial Disclosures (TCFD), a temporary arm of the Financial Stability Board chaired by Michael Bloomberg, publishes

recommendations for consistent, comparable climate-related disclosures.³⁴ This document, supported by over 500 organizations including top oil and gas companies, recommends that companies report on governance, strategy and risk management tactics using quantitative data to support qualitative disclosure. This principle holds especially true for non-operated assets. Qualitative disclosure can provide critical color beyond the often difficult-to-obtain quantitative metrics, and is particularly valuable for communication with external stakeholders.

While preparing for a future that includes quantitative non-operated disclosure, oil and gas companies can use qualitative narrative to inform stakeholders on steps being taken. This may include answering a few basic questions, such as:

1. What is the strategy for engaging joint venture partners on methane management?
2. What information, best practices and standards are shared and implemented with joint venture partners on methane?

34. "Final Report: Recommendations of the Task Force on Climate-Related Financial Disclosures (June 2017)." TCFD, 2018

3. Which joint venture partners have been engaged on this topic? What were the results of the initiative?

Embarking early on non-operated qualitative disclosure is important progress as reporting methane metrics from the vast networks of oil and gas joint ventures may take time and be challenging to verify, particularly for companies just starting to address this risk. Methane leaders can share qualitative insights with external stakeholders to demonstrate they are thinking about and working to address the challenge of non-operated assets, while recognizing that the evolution to robust disclosure may take time.

Technology innovation is advancing data collection and transparency.

Advances in methane detection and quantification technologies are making oversight and data collection easier, cheaper, and more transparent. Innovations like drone-mounted sensors and continuous, stationary methane monitors are gaining traction internationally. These technologies are being piloted and deployed by select leaders in industry today, who can

share their experiences and facilitate knowledge and technology transfer with partners to improve leak detection programs and data quality at non-operated assets.

There is a growing number of methane-detecting satellites either in orbit now or launching soon that will provide increasingly detailed mapping and measurement of global oil and gas emissions. Data from methane satellites, such as Environmental Defense Fund's MethaneSAT, will be available at no cost to industry, policy makers, investors and other stakeholders to identify high-priority, high-impact methane reduction opportunities.

Globally, satellites provide an additional tool by which companies taking action to address their emissions can measure their progress. While the data from satellites can provide value to leaders in this space, it will also put pressure on companies that are on the sidelines of the methane challenge. Inaction will become increasingly transparent and external stakeholders, like the financial community, will have new information available to them to reach conclusions about the scale and scope of progress.

The companies analyzed in this paper recognize methane is a challenge to their business and have made significant progress on how they disclose emissions reductions from operated assets. As these companies prepare for a future that includes robust non-operated disclosure, they can share qualitative narrative in the near-term on joint venture partner methane engagement. This step would signal to stakeholders that they recognize the importance of managing methane risk across portfolios.

Without some improvement in transparency about how methane is managed at non-operated assets, leading companies are missing an opportunity to temper stakeholder concern that companies do not perceive methane mitigation from these assets as a risk.

Qatargas 2 Trains 4 and 5, Qatar

In March 2018, Qatar Petroleum signed the Methane Guiding Principles, which commit the company to reduce emissions and increase transparency through “information in our relevant external reports on methane emissions data, methodologies used to derive these data, and progress and challenges in methane emissions

management.” Qatar Petroleum was the first GCC National Oil Company to join the Guiding Principles. As the company implements the Principles’ commitment to transparency, Qatar Petroleum can enhance methane disclosure.³⁵

FIGURE 17

Methane Management and Disclosure Practices of Qatargas 2 Companies

COMPANY	HEADQUARTERS	Publishes a sustainability report	Any mention of methane	Publicly reports any GHG emissions	Reports methane separately	Has a methane target	LDAR program
Qatargas	Qatar	✓	✗	✓	✗	✗	✗
Qatar Petroleum	Qatar	✗	✗	✗	✗	✗	✗
ExxonMobil	USA	✓	✓	✓	✓	✓	✓
Total	France	✓	✓	✓	✓	✓	✓

● NOC ● OPCO ● IOC □ Operators

35. “Reducing Methane Emissions across the Natural Gas Value Chain – Guiding Principles.” Climate and Clean Air Coalition, 2017

Conclusion

Forging the New Frontier for Methane Management

Results achieved on methane mitigation by the companies analyzed in this paper are a story of continuous progress. In the last five years, there has been a step change improvement in the ambition of public commitments and disclosure. Now, these companies have an important step change to make to advance the coverage of methane reduction efforts.

For industry leaders to achieve the magnitude of impact demanded by the global methane challenge, commitments and disclosure cannot be siloed to just half of a company's asset portfolio. We encourage companies to devise strategies for non-operated assets that complement existing efforts. Expanding reporting and methane reduction strategies to non-operated assets is not a small task. If the companies analyzed in this paper expand coverage to include NOAs, they would have to devise strategies

for, on average, 320 additional assets operated by 35 other companies.

While this presents a challenge, there are three things companies should consider as they begin to devise strategies for reducing methane emissions at non-operated assets:

Identify key partners.

A significant portion of non-operated production from these eight companies is concentrated within a few key assets and partners. As industry leaders

contemplate partner prioritization, they should examine which relationships have the potential to yield maximum coverage. Companies do not have to engage all partners at once to meaningfully extend the reach of their efforts. Instead, methane leaders can identify a few key business peers in geographies with significant assets and where methane mitigation strategies are not as advanced.

Leverage joint ventures.

Governance structures already exist for Health, Safety & Environment management through joint venture agreements. If joint ventures are harnessed appropriately, they can be effective channels for methane mitigation strategy proliferation at non-operated assets. Companies can engage their joint venture experts to understand how they can harness these existing structures to extend the coverage of commitments and improve methane management at non-operated assets.

Surface data and information.

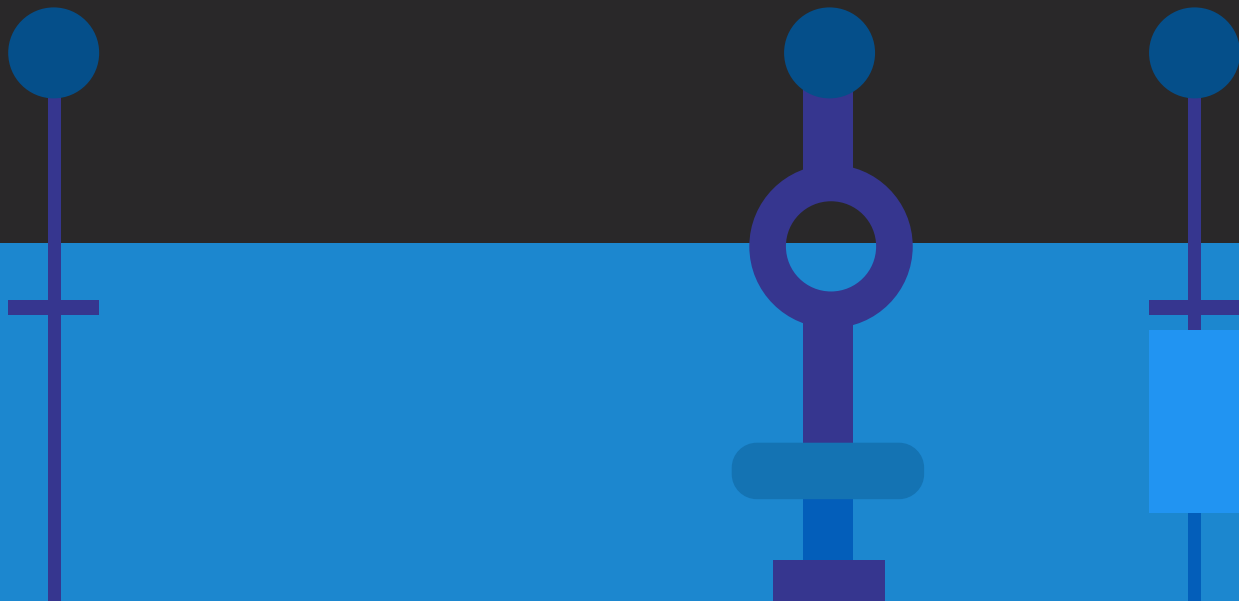
When it comes to methane, what gets measured gets managed. The companies analyzed in this report have harnessed best available data

from their operated assets to design methane reduction strategies and set targets. A key facet of the non-operated asset methane journey will be accessing the data and information necessary to inform the strategy. Companies can start to assess what data and information is already available, what is missing, and what is the critical path to devise an actionable non-operated asset methane reduction plan.

As the oil and gas industry adapts and evolves to stay relevant in a decarbonizing world, so too must its strategies for reducing methane emissions. Operated assets are a logical first step. However, for an industry where 40 - 60% of production portfolios are non-operated, these assets must have complementary methane reduction strategies as well. The companies analyzed in this paper have recognized methane as a business risk and are taking action to address this challenge. Reducing methane from non-operated assets is the next frontier for demonstrating a commitment to minimizing methane emissions and maximizing the impact of ongoing efforts.

Appendix

JV Networks of Analyzed Companies



Appendix

Companies that work together across many projects likely have developed business ties. Understanding joint venture networks can highlight pathways for companies to influence operating partners and may make it easier to select strategic partners for engagement on methane mitigation.

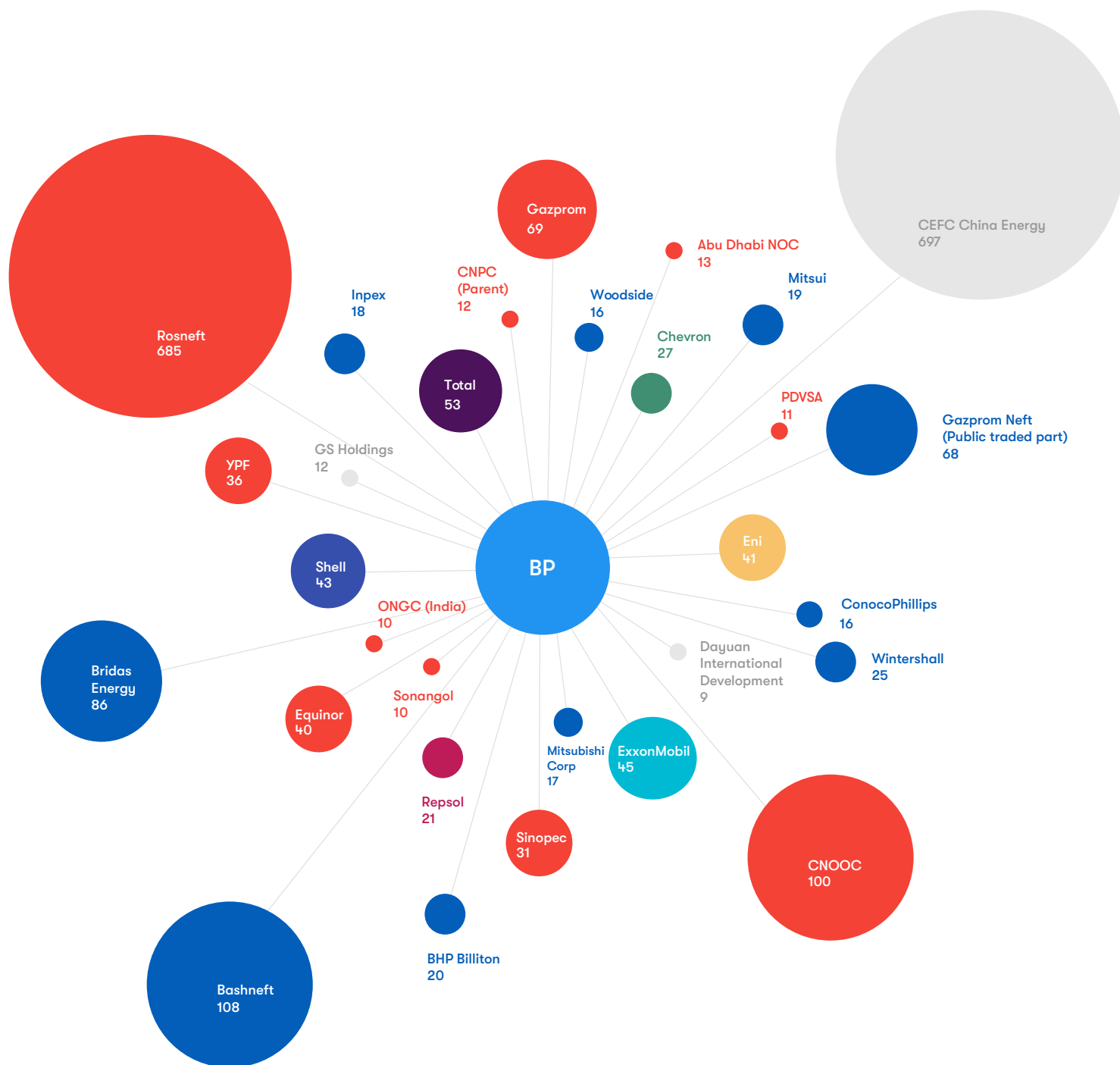
In order to better understand these relationships, EDF mapped the top 30 partners with which each analyzed company owns the most assets. In each figure, the size of the bubble represents the total number of assets the two companies are partners at. For example, BP and China National Offshore Oil Company (CNOOC) are both partners at 100 assets globally.

We understand that number of assets may not be directly comparable to the number of joint ventures between companies. In many instances, there may be one umbrella JV agreement that describes how an entire field of assets is run. However, this information

is often not publicly accessible. As a result, EDF is using assets as a proxy for joint ventures to understand the relationships between companies.

JV NETWORK MAP A

Top 30 Joint Venture Partners for BP

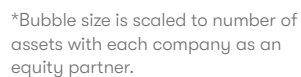


*Bubble size is scaled to number of assets with each company as an equity partner.

Source: Rystad Energy, 2018

● NOC ● Publicly Traded Company ● Other

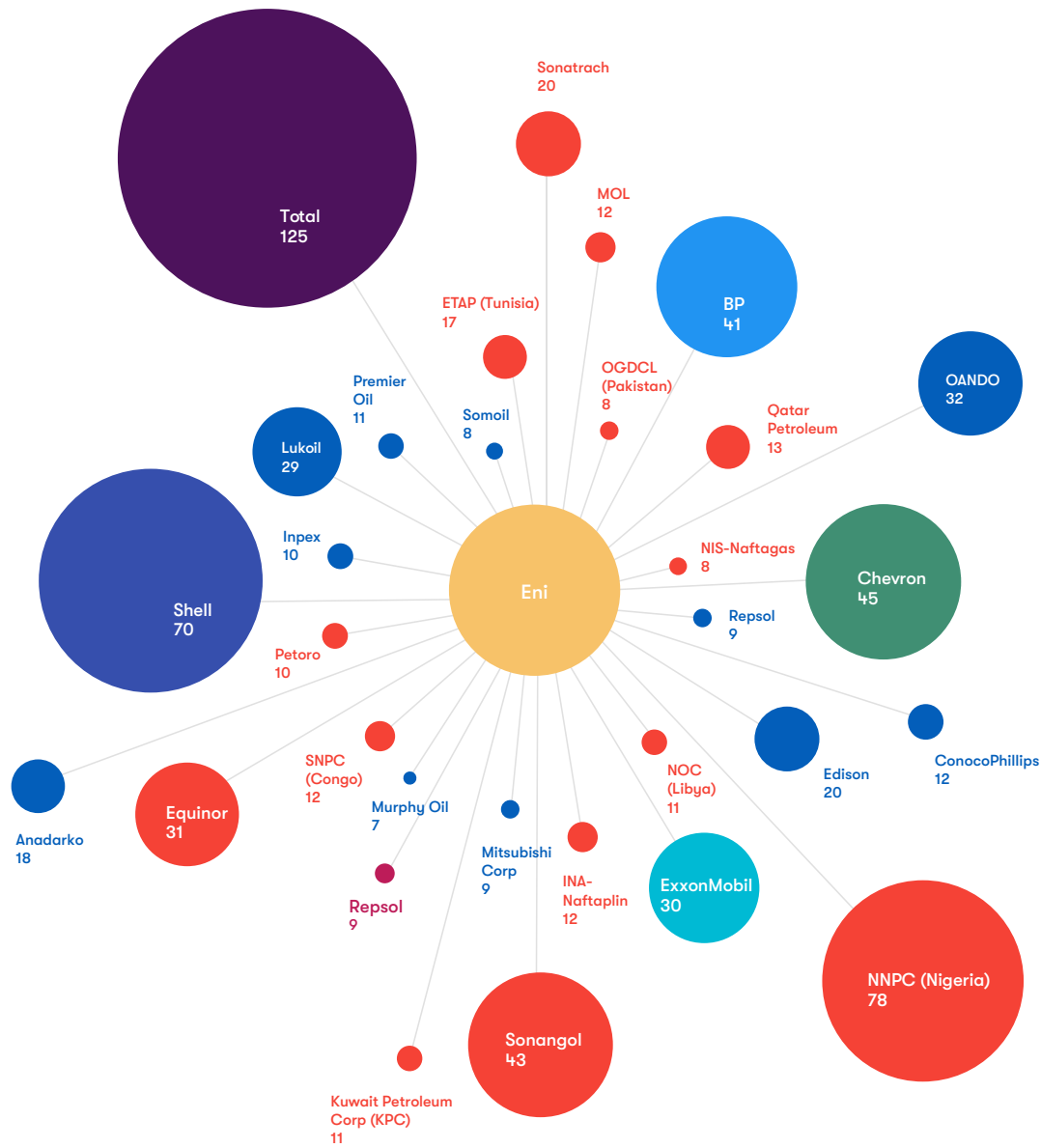
Top 30 Joint Venture Partners for Chevron



 NOC
  Publicly Traded Company
  Other

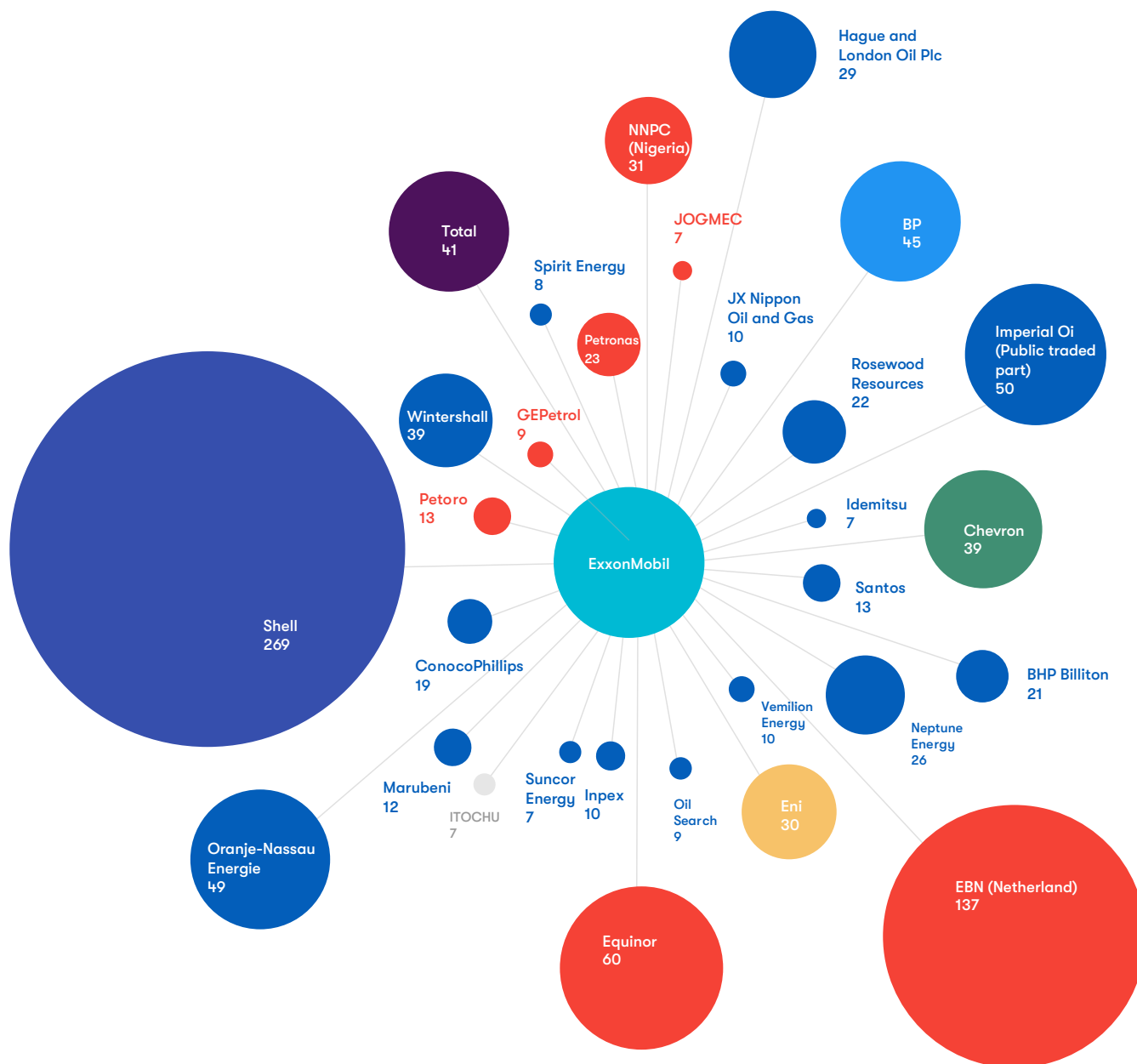
JV NETWORK MAP C

Top 30 Joint Venture Partners for Eni



*Bubble size is scaled to number of assets with each company as an equity partner.

Top 30 Joint Venture Partners for ExxonMobil

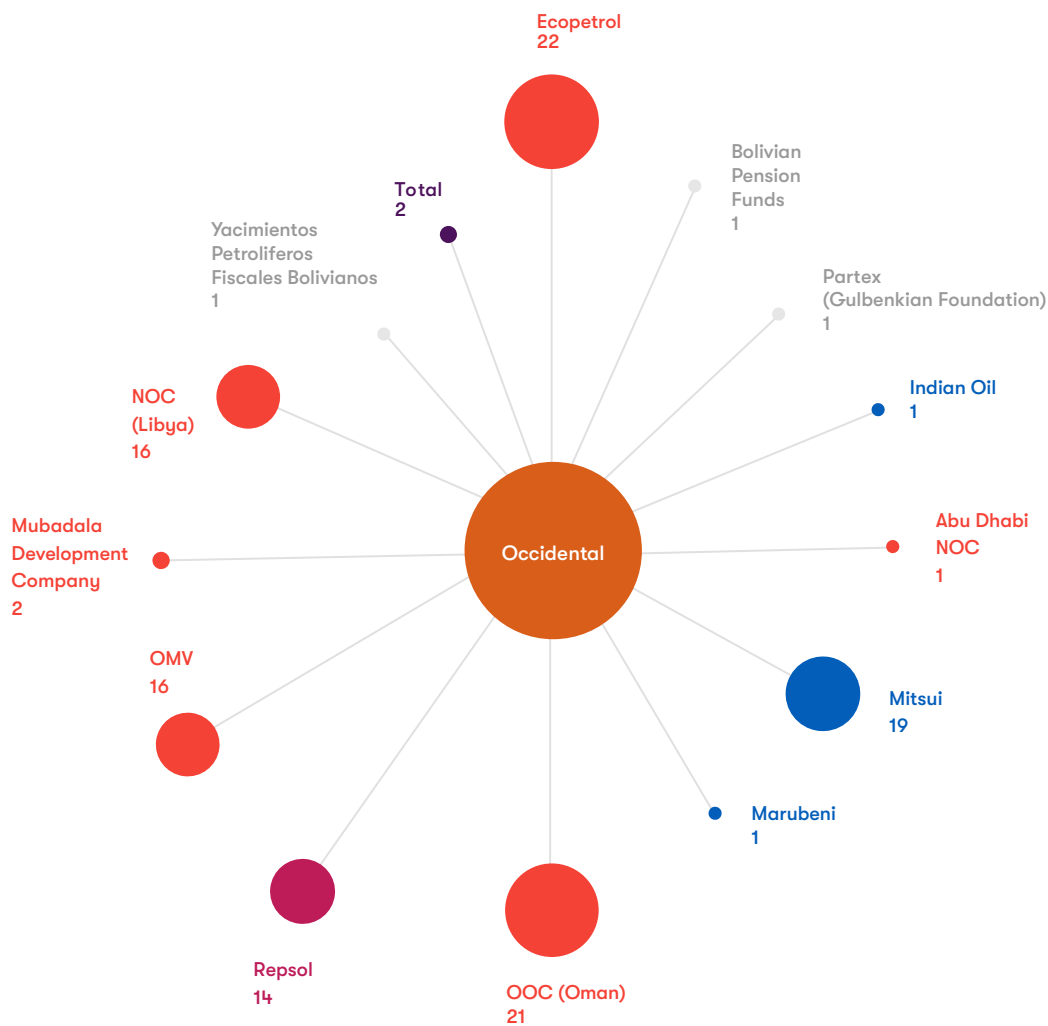


● NOC ● Publicly Traded Company ● Other

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JV NETWORK MAP E

Joint Venture Partners for Occidental



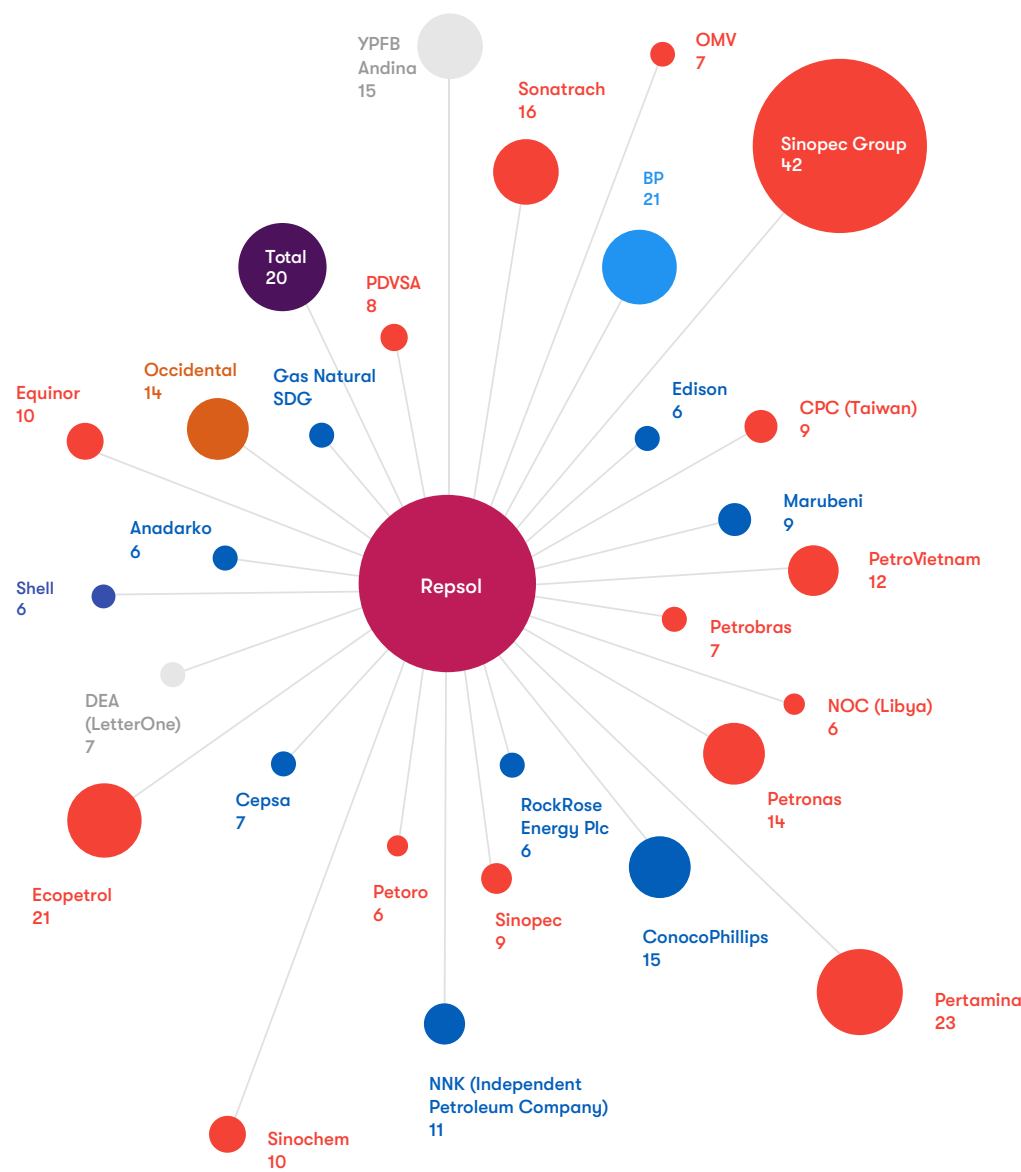
*Bubble size is scaled to number of assets with each company as an equity partner.

Source: Rystad Energy, 2018

● NOC ● Publicly Traded Company ● Other

JV NETWORK MAP F

Top 30 Joint Venture Partners for Repsol

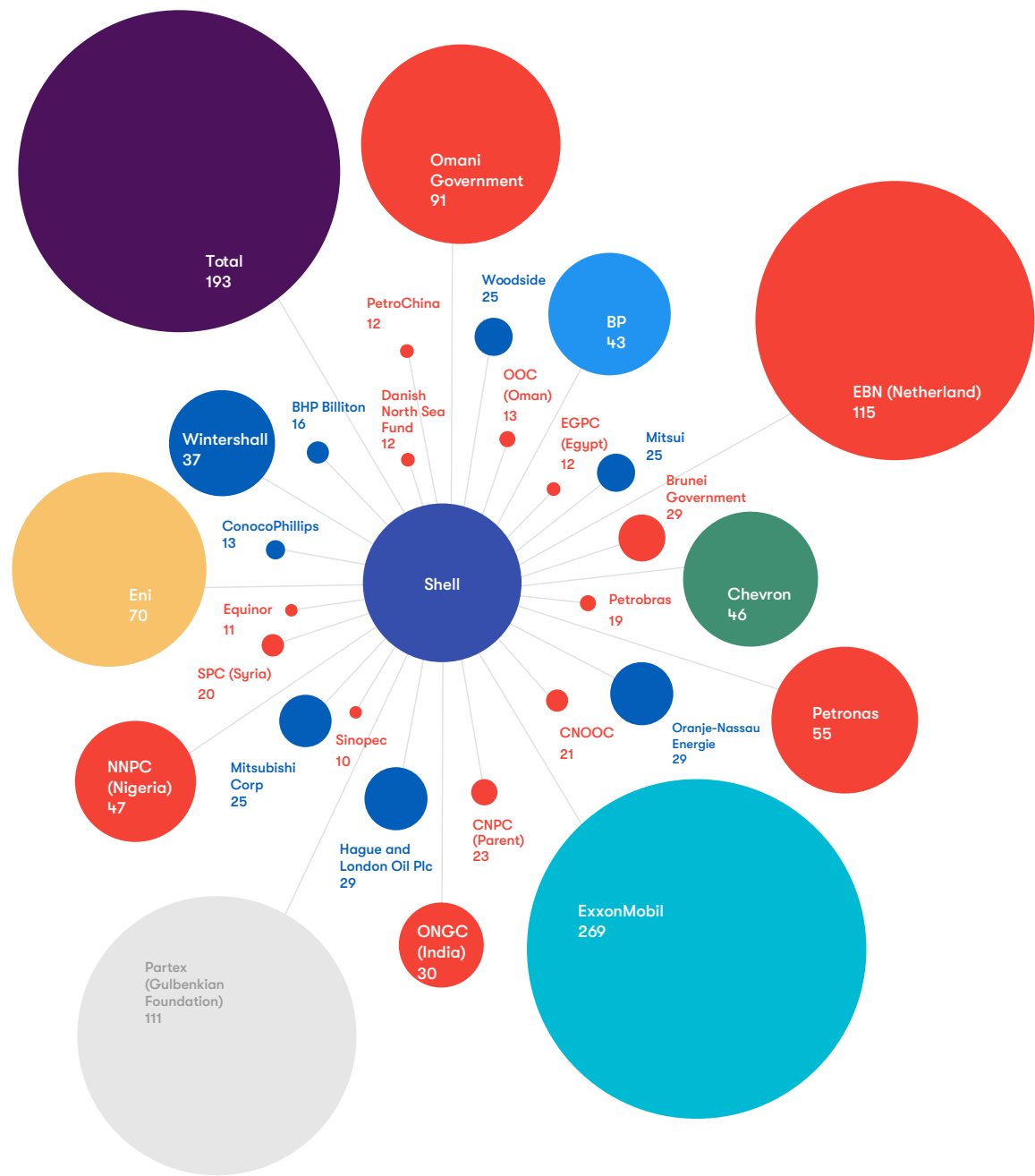


*Bubble size is scaled to number of assets with each company as an equity partner.

● NOC ● Publicly Traded Company ● Other

JV NETWORK MAP G

Top 30 Joint Venture Partners for Shell



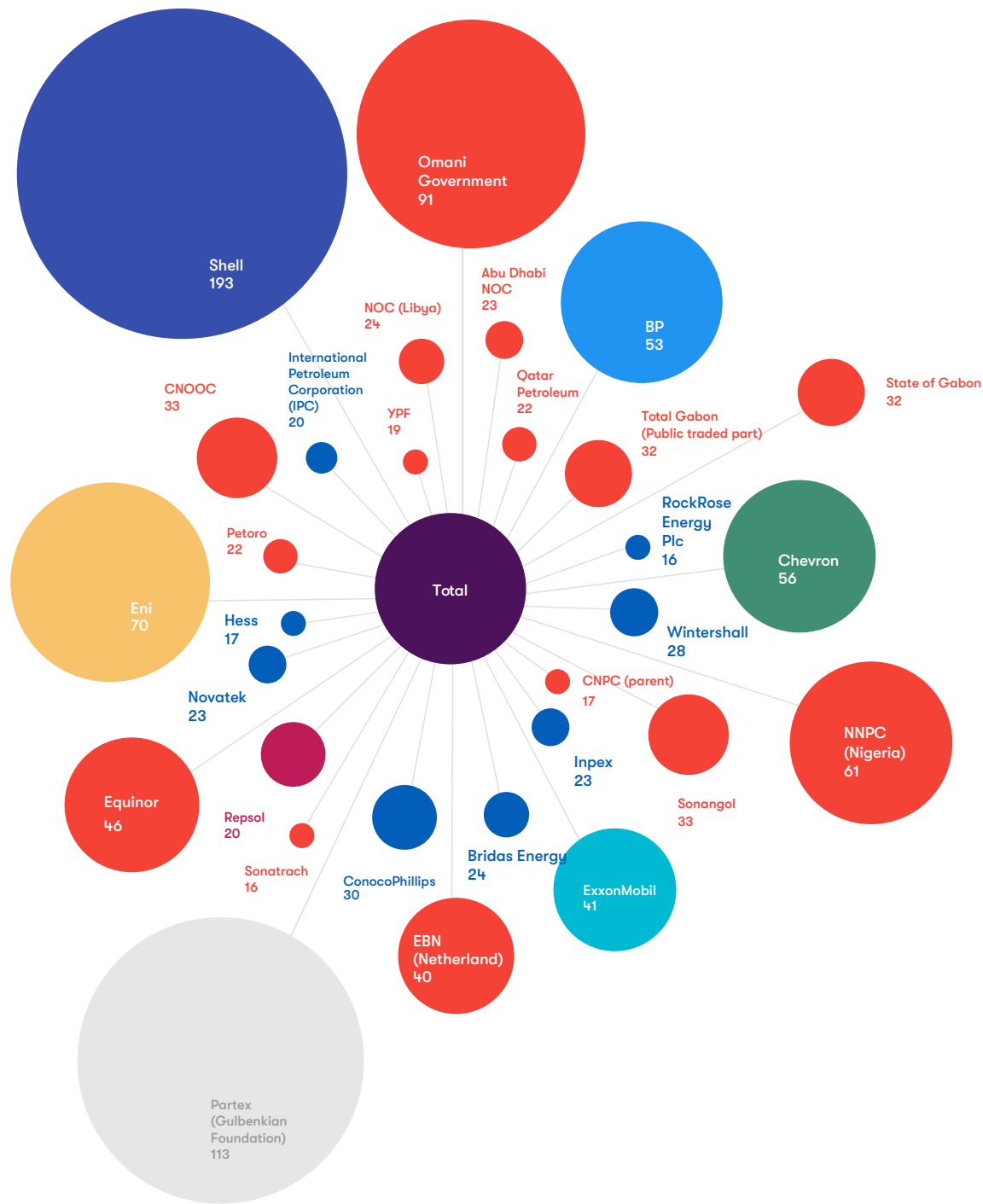
*Bubble size is scaled to number of assets with each company as an equity partner.

Source: Rystad Energy, 2018

● NOC ● Publicly Traded Company ● Other

JV NETWORK MAP H

Top 30 Joint Venture Partners for Total

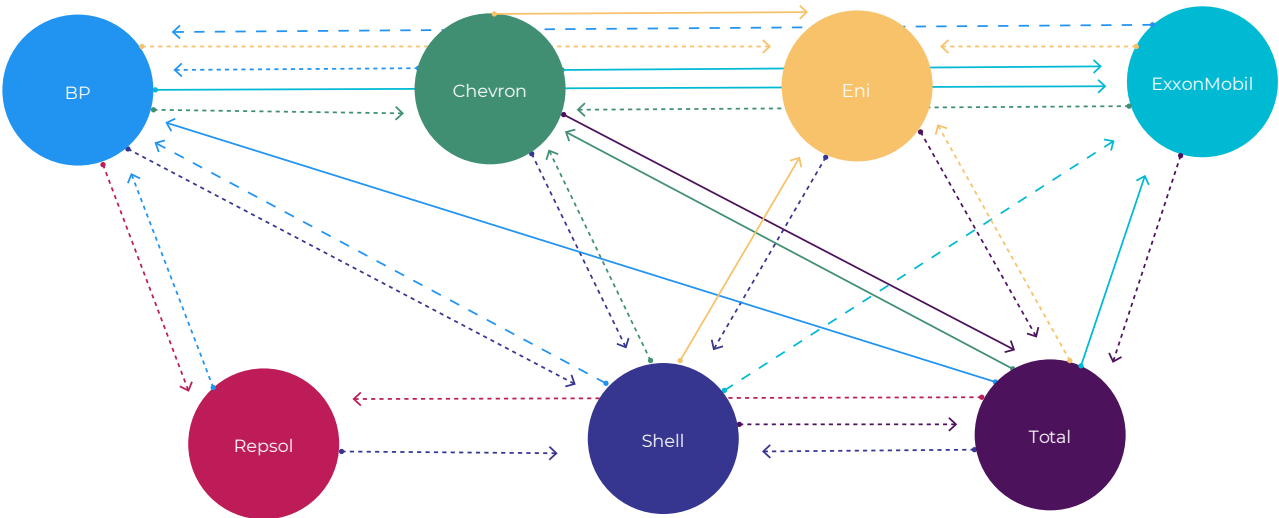


*Bubble size is scaled to number of assets with each company as an equity partner.

● NOC ● Publicly Traded Company ● Other

CHART 10B

Network of Analyzed Companies to Other Analyzed Companies



Source: Rystad Energy, 2018



