

UPDATE REPORT

Natural Gas Supply Collaborative

Promoting Safe and Responsible Production Practices

January 2019



MJB & A



UPDATE REPORT

Natural Gas Supply Collaborative

Promoting Safe and Responsible Production Practices

January 2019



Acknowledgments

This report is the product of a collaborative effort among the participants in the Natural Gas Supply Collaborative: Austin Energy, Calpine Corporation, Consolidated Edison Company of New York, CPS Energy, Énergir, Los Angeles Department of Water and Power, National Grid, NRG Energy, NW Natural, Pacific Gas and Electric Company, Vermont Gas and Xcel Energy.

M.J. Bradley & Associates LLC (MJB&A) convenes and manages the collaborative, overseeing development and release of all work products.

REPORT AUTHORS

Robert LaCount, MJB&A

Tom Curry, MJB&A

Nicole Pavia, MJB&A

REPORT DESIGN

Christopher E. Van Atten, MJB&A

MJB&A, founded in 1994, is a strategic consulting firm focused on energy and environmental issues. The firm includes a multi-disciplinary team of experts with backgrounds in economics, law, engineering and policy. The company works with private companies, public agencies and non-profit organizations to understand and evaluate environmental regulations and policy, facilitate multi-stakeholder initiatives, shape business strategies and deploy clean energy technologies.

For questions or comments about this report, please contact: NGSCFeedback@mjbradley.com

Introduction

The Natural Gas Supply Collaborative (NGSC) is a voluntary collaborative of natural gas purchasers promoting safe and responsible practices for natural gas supply.¹ Since its inception, NGSC has advanced the national discussion related to voluntary reporting on the environmental and social performance of natural gas production. It grew over the past year to include 12 companies that purchase gas equivalent to more than 13 percent of U.S. marketed natural gas. This is enough natural gas to meet the needs of more than 41 million households and, as a part of portfolio of resources, generate enough electricity from natural gas to power almost 17 million households.²

In October 2017, NGSC published a concise set of environmental and social performance indicators that responded to stakeholder questions about natural gas production.³ NGSC highlighted key topic areas of interest from the perspective of natural gas purchasers. With the publication of the non-financial indicators and subsequent engagement with natural gas producers, NGSC is encouraging natural gas producers to provide a public, accessible, clear and thorough discussion of important environmental and social issues through company websites and annual reporting. This type of voluntary reporting goes beyond demonstrating compliance with regulations and helps a company communicate directly with its stakeholders. NGSC participants have realized the benefits of increased engagement with stakeholders through their own voluntary reporting and disclosure initiatives.

In 2018, NGSC built on the momentum created by the publication of its environmental and social performance indicators for natural gas production. The group developed new public resources to educate participant customers and other interested parties and increased engagement with external stakeholders. Throughout 2018, the group communicated directly with natural gas producers and producer associations to open dialogue around issues related to environmental and social topics and continued to engage with environmental groups. NGSC also worked to support broader

Report Summary

This report features new resources developed by NGSC to increase accessibility of information on natural gas production and highlights progress made by natural gas producers in 2018 through voluntary actions related to social and environmental issues, including commitments to reduce methane emissions. The report summarizes:

- Recent natural gas supply chain trends that align with NGSC goal to promote safe and responsible practices for natural gas supply through voluntary reporting.
- NGSC resources on natural gas production and producer voluntary reporting on environmental and social topics.
- NGSC environmental and social performance indicators for natural gas production.

¹ NGSC participants: Austin Energy, Calpine Corporation, Consolidated Edison Company of New York, CPS Energy, Énergir, Los Angeles Department of Water and Power, National Grid, NRG Energy, NW Natural, Pacific Gas and Electric Company, Vermont Gas and Xcel Energy.

² Estimates based on MJB&A calculations using U.S. Energy Information Administration data for average household natural gas and electricity use.

³ A report detailing the performance indicators and other supporting information is available for download from the Natural Gas Supply Collaborative website at: <http://www.mjbradley.com/NGSC>

involvement of companies in the natural gas industry to address environmental and social topics related to the natural gas production, distribution and use. NGSC's activities and its engagement with others in the natural gas industry have been publicly recognized in reports by leading organizations focused on transparency in reporting.⁴

A key part of the collaborative's focus is monitoring and, where appropriate, supporting

efforts throughout the industry that are consistent with NGSC's objective to promote safe and responsible practices for natural gas supply. This report highlights steps taken across the natural gas supply chain in 2018 consistent with that objective. These include announcements by several natural gas producers establishing methane emissions targets as well as the first publicly announced transaction for natural gas that included certification related to environmental and other attributes.

Benefits of Reporting

As key players in the natural gas value chain, both producers and purchasers benefit from robust voluntary reporting on safe and responsible practices in natural gas production.

Robust voluntary reporting offers important benefits to natural gas producers and other stakeholders:

- *Improving Performance.* Environmental and social metrics tracked through the reporting process help companies assess their operations and identify opportunities to reduce costs and improve safe and responsible production practices.
- *Publicizing Accurate Information.* Voluntary environmental and social reporting provides the opportunity for companies to directly communicate with the public and educate stakeholders on corporate priorities and sustainability practices.
- *Building Transparency and Trust with Stakeholders.* Companies can strengthen their social license to operate by engaging with and responding to stakeholders.

More information on responsible practices in natural gas production will help NGSC participants address important business needs and better respond to stakeholders, including:

- *Increasing Understanding of Natural Gas Supply.* NGSC participants engage a wide variety of suppliers to better understand the inputs to their business and want to extend engagement to natural gas suppliers.
- *Addressing Stakeholder Questions.* Access to more information will help NGSC participants respond to stakeholder questions and concerns.
- *Supporting Corporate Sustainability Goals.* Greater visibility in the supply chain helps companies meet sustainability goals.

⁴ As You Sow, *The End of the Line*, July 12, 2018. p. 18-19. Available at: <https://www.asyousow.org/reports/2018/7/10/end-of-the-line>; and Ceres, Environmental Defense Fund and Principles for Responsible Investing, *Setting the Bar: Implementing the TCFD Recommendations for Oil and Gas Methane Disclosure*, October 17, 2018. p. 22. Available at: <https://www.edf.org/energy/setting-bar-methane-disclosure>

This report also highlights resources developed by NGSC to make public information on industry practices more readily available to investors and customers. Published at the same time as this report, the resources developed by NGSC include a web portal with information on natural gas production trends in the U.S. and links to voluntary reports published by natural gas producers.⁵

Finally, this report summarizes the environmental and social performance indicators for natural gas production. NGSC participants are reaffirming

support for more robust voluntary reporting by natural gas producers on the identified non-financial performance indicators. Information sharing about environmental and social practices related to natural gas development supports a virtuous cycle where companies highlight their practices, companies and stakeholders benefit from more information on leading practices, and stakeholders and the public gain greater insights into how companies protect the environment and local communities.

⁵ The resources are available at: <https://www.mjbradley.com/content/ngsc-resources>

Natural Gas Supply Chain Trends

Companies in the natural gas supply chain advanced efforts in 2018 that promote safe and responsible practices for natural gas supply and are consistent with the priorities expressed through the environmental and social performance indicators identified by NGSC. Two of the notable areas of progress were commitments to meet voluntary methane emissions targets and the first public transactions for natural gas that met specified environmental performance criteria.

Voluntary Approaches to Reduce Methane Emissions

A number of companies took important steps to address methane emissions from the natural gas supply chain over the past year, individually and as a part of broader coalitions. The companies and coalitions used a range of approaches to commit to voluntary methane emission reductions including emissions intensity targets, absolute emissions targets, and measures-based goals. The voluntary publication of information about these actions represents valuable examples for the broader industry and are consistent with NGSC's request for additional transparency on methane emissions and voluntary strategies to manage methane emissions.

Intensity Targets

Companies responsible for more than 20 percent of U.S. marketed natural gas production in 2017 have committed to individual or collective methane emission intensity targets.⁶ Intensity targets set an emissions rate expressed as a percentage of production or throughput, providing a way to normalize emissions output. While this type of target means that total emissions quantity will vary depending on how much natural gas is produced or transported, it provides natural gas companies with the flexibility to accommodate changes in production or throughput in response to market forces, divestitures, or acquisitions, while also providing a way to measure the impact of

deploying methane reduction strategies and practices.

The majority of these commitments were made in 2018, including announcements by BP, Shell and the Oil and Gas Climate Initiative (OGCI), and the addition of companies to ONE Future.⁷ The announced targets and bases for the intensity calculations are summarized in Table 1. As companies and organizations start reporting data demonstrating progress toward meeting the targets, NGSC will be working to understand the scope of the included emissions and differences in emissions intensity calculation methodologies. NGSC will also be looking for company-level reporting on emissions and strategies.

While BP and Shell have announced targets that cover company operations, the OGCI and ONE Future targets are structured as multi-company targets that will be (and have been, in the case of ONE Future) reported on a coalition basis. OGCI is a voluntary initiative with a goal of lowering the greenhouse gas footprint of member companies, including BP, Eni, Equinor, Chevron, CNPC, ExxonMobil, Occidental Petroleum, Pemex, Petrobras, Repsol, Royal Dutch Shell, Saudi Aramco and Total. In September 2018, OGCI announced a target to reduce the collective average methane intensity of its aggregated upstream gas and oil operations to below 0.25 percent by 2025, with ambition of achieving 0.20 percent by the same year.

⁶ This figure includes natural gas produced by members of the ONE Future coalition and members of the Oil and Gas Climate Initiative as well as Royal Dutch Shell, which is not a member of either group.

⁷ Dominion Energy, EQT, Berkshire Hathaway Energy Pipeline Group, and Noble Energy joined ONE Future in 2018.

Table 1. Methane Intensity Commitments by Natural Gas Companies and Coalitions

Company or Organization	Intensity Target	Intensity Equation
BP	0.2% and commitment to hold below 0.3% (target date not reported)	$\frac{\text{Total methane emissions from BP marketed natural gas}}{\text{Total BP marketed natural gas}}$
Royal Dutch Shell	0.2% by 2025	$\frac{\text{Total methane emissions from Shell operated oil and gas assets}}{\text{Total Shell oil and natural gas marketed}}$
Oil and Gas Climate Initiative (OGCI)	0.25% by 2025 with an ambition of 0.20%	$\frac{\text{Total methane emissions from all OGCI companies}}{\text{Total marketed natural gas from all OGCI companies}}$
ONE Future	1.0% for the entire natural gas value chain (0.28% goal for production, 0.09% goal for gathering & boosting)	$\frac{\text{Weighted average methane emissions from ONE Future companies}}{\text{Total gross natural gas production}}$

References

Royal Dutch Shell, “Shell announces methane emissions intensity target for oil and gas assets”, Press Release, September 17, 2018. Available at: <https://www.shell.com/media/news-and-media-releases/2018/shell-announces-methane-emissions-intensity-target.html>

BP, “Tackling Methane”, April 2018. Available at: <https://www.bp.com/en/global/corporate/sustainability/climate-change/tackling-methane.html>

Saphina Waters (OGCI), “Methodological Note for OGCI Methane Intensity Target and Ambition”, September 24, 2018. Available at: <http://info.oilandgasclimateinitiative.com/blog/methodological-note-for-ogci-methane-intensity-target-and-ambition>

ONE Future, “Methane Emissions Estimation Protocol”, August 2018. Available at: http://onefuture.us/wp-content/uploads/2018/11/ONE-Future-Methane-Intensity-Protocol_V2.3_27Aug18.docx

Launched with 8 companies in 2014, ONE Future is currently a group of 16 natural gas production, transmission and distribution companies that have agreed to voluntarily reduce methane emissions across the supply chain. Membership includes Antero Resources, Apache, Berkshire Hathaway

Pipeline Group, BHP, Dominion Energy, Equinor, EQT, Hess, Kinder Morgan, National Grid, Noble Energy, Jonah, Southern Company Gas, Southwestern Energy, Summit Utilities and TransCanada. ONE Future has a broader scope than other announcements and is committed to

developing segment-specific methane emissions reduction goals that, when combined, will reduce the average annual rate of methane emissions across collective operations to one percent (or less) of production by 2025. To achieve this goal, ONE Future developed segment-specific intensity targets from production and gathering, processing, transmission and storage, and distribution. In November 2018, ONE Future released a report⁸ stating that the organization had surpassed its goal, achieving a coalition-wide methane intensity of 0.552 percent in 2017.

Absolute Emissions Targets

As coalitions and companies announced intensity targets to address the issue of methane emissions, other companies have announced absolute emissions targets. These targets set a limit on total methane emissions, independent of production rates or pipeline throughput, and often take the form of percentage reductions in methane emissions from a set baseline. Absolute targets can guarantee specific emission reductions, and it is possible to calculate the exact emissions saved compared to a specified baseline year.

In an April 2018 report, *Taking Aim: Hitting the mark on oil and gas methane targets*, EDF called on companies to commit to a 75 percent reduction in methane emissions from oil and gas operations on an absolute basis, but also outlined its perspective on the key elements of intensity targets for the oil and gas sector.⁹ In its guidance, EDF recommends that emissions from all oil and gas production, including stranded and marketed associated gas, be included in the calculation of an intensity target. EDF estimates that a 75 percent absolute reduction in methane emissions is feasible with today’s technology and practices and proposed a 0.20 percent leakage rate as an emissions intensity target for production that provides similar methane emissions reductions to the 75 percent absolute target.

In addition to being part of the OGI intensity commitment, ExxonMobil subsidiary XTO Energy and Eni have committed to company-specific absolute methane emission targets. ExxonMobil’s target is a 15 percent decrease in methane emissions and a 25 percent reduction in flaring by 2020, compared to a 2016 baseline. Eni’s target is to reduce fugitive upstream methane emissions 80 percent by 2025, compared to a 2014 baseline. These targets are summarized in Table 2.

Table 2. Absolute Methane Target Commitments by Natural Gas Companies

Company	Absolute Methane Target
XTO Energy	Reduce methane emissions 15% and flaring 25% by 2020 from 2016 baseline
Eni	Reduce upstream fugitive methane emissions 80% by 2025 from 2014 baseline

References

ExxonMobil, “ExxonMobil Announces Greenhouse Gas Reduction Measures”, Press Release, May 23, 2018. Available at:

<https://news.exxonmobil.com/press-release/exxonmobil-announces-greenhouse-gas-reduction-measures>

Eni, “Reduction in direct GHG emissions”, Eni Emissions reduction webpage. Available at:

https://www.eni.com/en_IT/sustainability/decarbonization/strategy-investment/reducing-emissions.page#

Measures-Based Targets

A third target type is based on a commitment by companies to deploy specific measures or technologies to achieve emissions reductions. This approach allows companies to focus on technology deployment as opposed to emissions measurement and verification. One example of an organization using this approach is the Environmental Partnership started with leadership from the

⁸ ONE Future, “ONE Future 2017 Methane Emission Intensities: Initial Progress Report”, November 15, 2018. Available at: <http://onefuture.us/wp-content/uploads/2018/11/ONE-Future-2017-Initial-Report-Final-Report-Nov-15.pdf>

⁹ Environmental Defense Fund, “Taking Aim: Hitting the mark on oil and gas methane targets”, April 2018. Available at: https://www.edf.org/sites/default/files/documents/EDF_TakingAim.pdf

American Petroleum Institute. The organization's focus has been to reduce members' methane emissions and volatile organic compounds (VOCs), and it has developed three Environmental Performance Programs – pneumatic controller upgrades, manual liquids unloading, and leak detection and repair – for participating companies

Market Developments

Recent market developments point to growing investor and customer interest in natural gas that has lower associated methane emissions and meets other environmental and social criteria. A number of NGSC participants are working individually on programs that leverage NGSC's environmental and social performance indicators to gain greater visibility into their own natural gas supply chains.

Additionally, external organizations are developing programs that identify facilities or producers that meet specific criteria. On September 6, 2018, the Independent Energy Standards Corporation (IES) announced the completion of the first public transaction of a natural gas product certified through its TrustWell™ Ratings system.¹¹ The

to implement and phase into their own operations. These programs recommend specific technologies and timelines. The Partnership has more than doubled in size in its first year, made up of 53 oil and natural gas-producing companies that represent nearly one-third of the industry's production.¹⁰

TrustWell™ system focuses on four categories of natural gas producer and purchaser impact – water, air, land and community – and its ranking process combines an “inherent risk profile” per facility with a score for operational controls for each company. The transaction occurred between Southwestern Energy Company and New Jersey Natural Gas, and the gas will be distributed to New Jersey households. Subsequently, IES announced a joint effort with the data analytics company Xpansiv to expand the TrustWell™ Responsible Gas Program.¹² On November 27, 2018, Carbon Creek Energy, in partnership with Xpansiv and GP Energy Management, entered into a contract with East Coast Power & Gas to provide TrustWell™ certified natural gas.¹³

¹⁰ American Petroleum Institute, “The Environmental Partnership more than doubles in size in its first year”, December 4, 2018. Available at: <https://www.api.org/news-policy-and-issues/news/2018/12/04/the-environmental-partnership-more-than-doubles-in-size-in-its-first-year>

¹¹ Independent Energy Standards Corporation, “IES Makes History in Oil & Gas Industry and Establishes Market for Differentiated Gas by Completing First TrustWell™ Responsible Gas Transaction”, Press Release, September 6, 2018. Available at: <https://ies.co/ies-makes-history/>

¹² Independent Energy Standards Corporation, “Market Leaders IES and Xpansiv Partner Together to Bring TrustWell™ Responsible Gas to Broader Financial Markets”, Press Release, November 1, 2018. Available at: <https://ies.co/market-leaders-ies-and-xpansiv-partner/>

¹³ Cision PRWeb, “Partnership Between Carbon Creek and Xpansiv Provides Energy Markets with Unprecedented Frack-Free Natural Gas”, Press Release, November 27, 2018. Available at: https://www.prweb.com/releases/partnership_between_carbon_creek_and_xpansiv_provides_energy_markets_with_unprecedented_frack_free_natural_gas/prweb15948451.htm

Resources Developed by NGSC

Part of NGSC’s focus in 2018 has been developing resources to respond to stakeholder questions about natural gas production. Accompanying the release of this report, NGSC has published a web portal (accessible at <https://www.mjbradley.com/content/ngsc-resources>) with two sets of resources that participants can use to inform stakeholders, including customers, about natural gas production, current voluntary reporting and actions by natural gas producers to address environmental and social concerns.

U.S. and State Natural Gas Production Data

Using the interactive features available on the NGSC website, users can explore historical natural gas production by state and resource type. The website currently includes:

- Total natural gas production over time from 2000 to 2017, on aggregate and by state;
- State natural gas production data by resource type (conventional, coalbed methane, shale gas, oil well gas) over time from 2000 to 2017; and
- Production by shale play over time from 2000 to 2017.

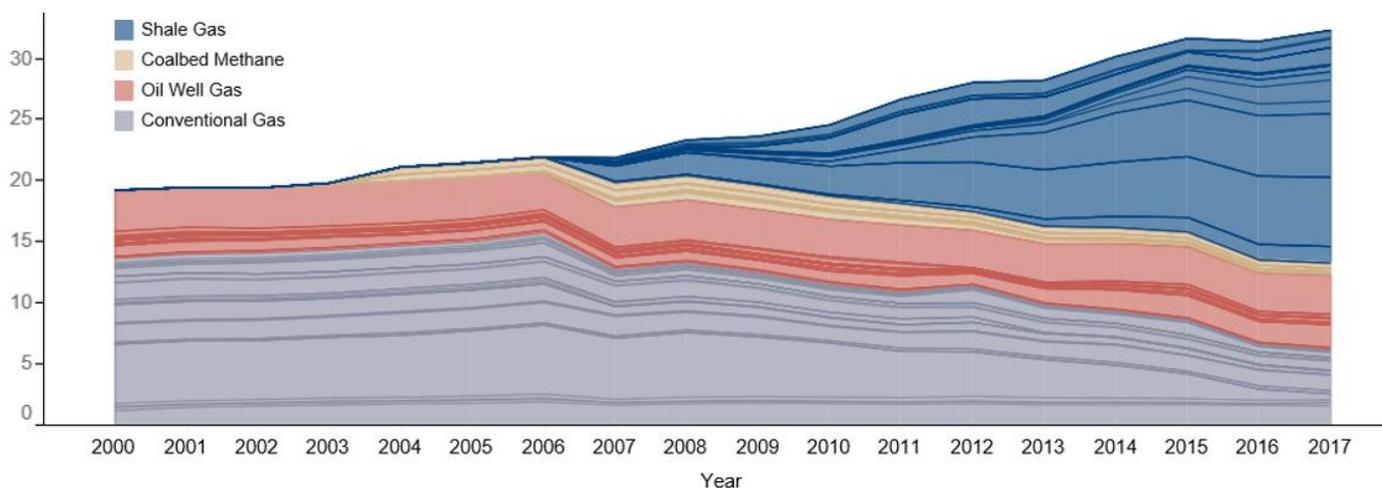
As an example of the type of information users can explore on the website, Figure 1 shows how U.S. natural gas production has shifted from

conventional resources to shale resources. In 2000, conventional natural gas made up approximately 70 percent of gas produced, followed by oil well gas. However, beginning in 2007, the proportion of shale gas production began to grow significantly, such that shale gas accounted for over half of all gas production in 2017. Conventional gas production has decreased since 2000 to approximately 20 percent of total production in 2017.

Users can also access state-level data. For example, Figure 2 shows that in Texas, which produces more gas than any other state, shale gas production has grown significantly over time while its share of conventional gas has decreased.

As a further example, Figure 3 reflects increased exploration and production of shale gas in the

Figure 1. Historical U.S. Natural Gas Production by Resource Type (Tcf)



Source: MJB&A Analysis, EIA

Marcellus and Utica formations that has allowed states like Pennsylvania and Ohio to join Texas as

natural gas production leaders over the past decade.

Figure 2. Historical Texas Natural Gas Production by Resource Type (Tcf)

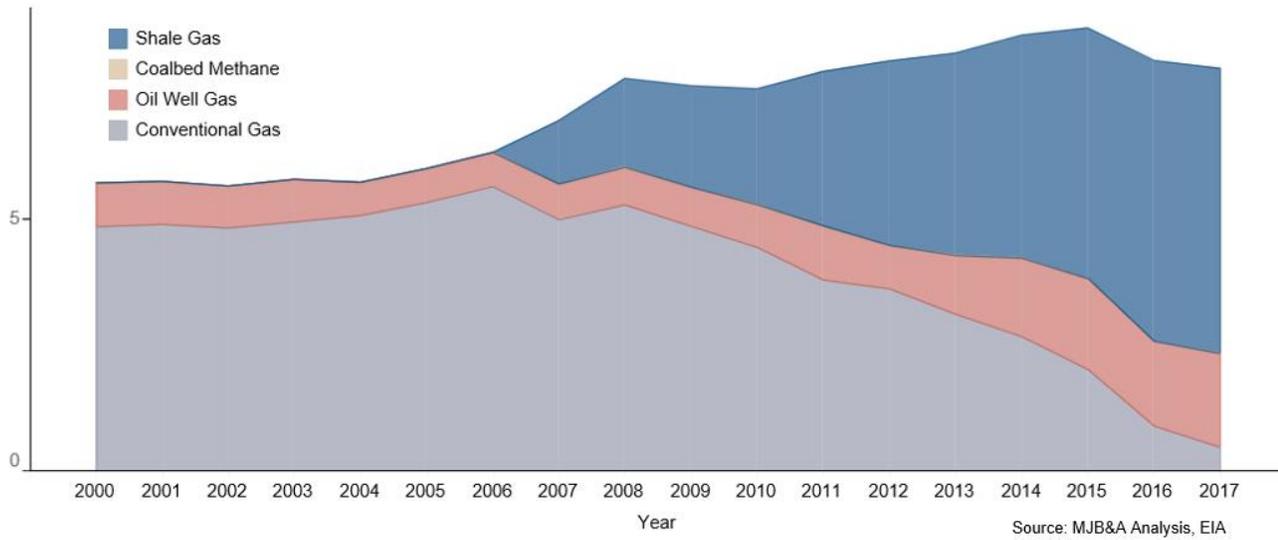
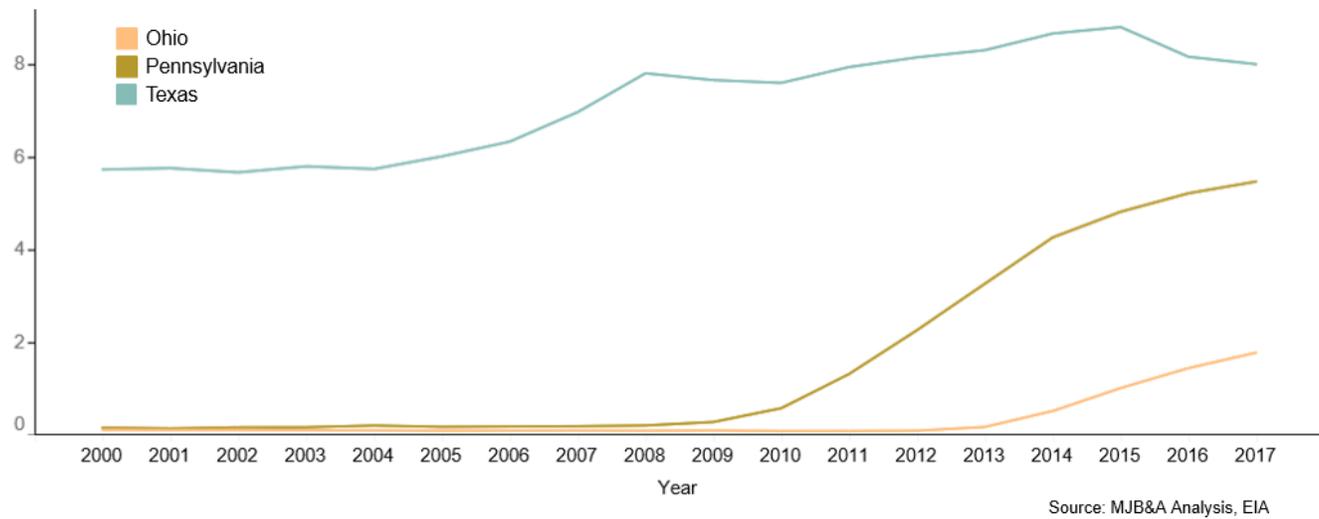


Figure 3. Total State Production for Select States (Tcf)



Voluntary Reporting on Environmental and Social Performance

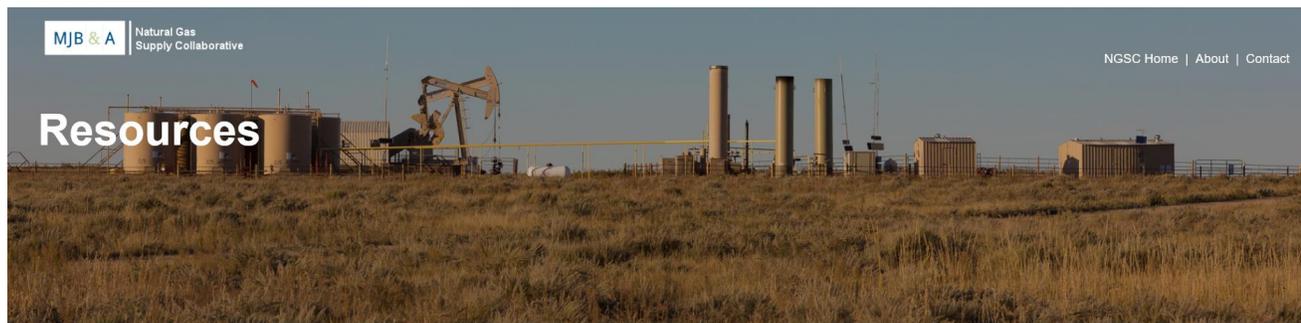
In recent years, a number of leading companies have expanded their public disclosure to include a wide range of stakeholder issues, including those covered by the NGSC performance indicators. Over the last year, producers have continued to refine disclosure reports as stakeholders express interest in the information producers make publicly available. In particular, shareholders have put forward resolutions related to methane emissions, and organizations have released reports highlighting the importance of reporting on specific methane metrics.¹⁴

To assist stakeholders as they seek to understand voluntary reporting by natural gas producers on environmental and social performance, NGSC completed an initial review of natural gas producer websites and press releases. Based on this information, NGSC developed a database of links to voluntary public disclosures by natural gas

production companies related to environmental and social topics (see Figure 4). These resources include sustainability reports and corporate websites. While NGSC encourages natural gas producers to disclose information related to the NGSC performance indicators, the purpose of these resources is to facilitate public access to reported information, not to evaluate companies on their reporting. NGSC participants have reviewed the information included in these reports and used them to inform discussions about environmental and social issues related to natural gas production.

Initially, NGSC has populated the list with the top 40 companies by volume of gas produced in 2017. NGSC plans to continue engaging with natural gas producers and to expand the website to include links to public disclosures on environmental and social issues by additional producers.¹⁵

Figure 4. Sample of NGSC Resource Page Featuring Natural Gas Producer Voluntary Reporting



NGSC has developed an inventory of links to voluntary public disclosures by natural gas production companies related to environmental and social topics. These resources include sustainability reports and corporate websites. Below is a list of the largest 40 companies by volume of gas produced in 2017 and their voluntary disclosure documents.

Company	Production State(s)	Resource(s)
EQT	KY, OH, PA, VA, WV	2018 Corporate Social Responsibility Report 2017 Corporate Social Responsibility Report Sustainability Reporting website
ExxonMobil (XTO)	AR, CO, KS, LA, MT, NM, ND, OH, OK, PA, TX, UT, WV, WY	2018 Energy & Carbon Summary 2017 Sustainability Report XTO Energy ExxonMobil Corporation
Chesapeake	LA, OH, OK, PA, TX, WY	2017 Corporate Responsibility Highlights Corporate Responsibility Website
Southwestern	AR, PA, WV	2018 Corporate Responsibility Report

¹⁴ See Interfaith Center on Corporate Responsibility (ICCR), “Methane Disclosure in the Oil & Gas Industry”, 2018. Available at: <https://www.iccr.org/methane-disclosure-oil-gas-industry-tracking-impact-shareholder-engagement>. And EDF, “The Disclosure Divide”, February 2018. Available at: https://www.edf.org/sites/default/files/documents/the_disclosure_divide.pdf.

¹⁵ Natural gas production companies wishing to be added to the list can email a link to voluntarily reported information to NGSCFeedback@mjbroadley.com.

Environmental and Social Performance Indicators for Natural Gas Production

While there was considerable focus on methane in 2018, NGSC continues to be interested in the four categories of environmental and social performance indicators identified in 2017: (1) methane and air emissions, (2) water, (3) chemical use, and (4) community impacts and workforce safety. Table 3 summarizes the environmental and social performance indicators identified by NGSC. NGSC continues to support and encourage voluntary company-level reporting by natural gas producers on all the non-financial performance indicators. Additional background is available through the NGSC website at: <http://www.mjbradley.com/NGSC>.

Methane and Air Emissions



Methane is a potent greenhouse gas that can be released during natural gas production and across all segments of the natural gas supply chain. The natural gas industry has taken steps to reduce air emissions,

including methane emissions, through voluntary actions and compliance with state and federal requirements. From 2007 to 2016, the methane emissions intensity of natural gas production in the U.S. decreased 25 percent.¹⁶ Over the same period, total methane emissions associated with production increased by two percent as production increased by over 30 percent.¹⁷

As described earlier in this report, 2018 brought additional focus to methane emissions, with companies and coalitions establishing targets to

reduce methane leak rates and testing new detection and quantification technologies. The performance indicators can help track continued progress.

In addition to methane, the production segment can also emit gases that contain hazardous air pollutants and other VOCs. VOCs are precursors to ozone and are a particular concern in areas that exceed health-based ozone levels established by EPA, known as ozone nonattainment areas. The performance indicators focus on methane emissions with the recognition that many methane control strategies simultaneously reduce VOCs and hazardous air pollutants in the production segment of the natural gas supply chain.

Water



Clean, potable water is vital for healthy communities and sustainable economies. At the same time, it is a finite resource that is under stress in many regions due to drought,

population growth, and economic development. As in many industries, water plays an instrumental role in natural gas production, particularly at wells that use hydraulic fracturing. The hydraulic fracturing process involves injecting water with chemical additives underground at high pressure.

¹⁶ MJB&A calculations based on EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016 (April 2017). Available at: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2016>

¹⁷ MJB&A calculations based on EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015 and U.S. Energy Information Administration data on natural gas production.

While hydraulic fracturing can impact local water supplies, overall, the amount of water used in the process has been calculated as less than one percent of total U.S. industrial water use.¹⁸ Good stewardship of this natural resource requires prudent use of water along with appropriate measures to prevent contamination of water supplies.

Programs to protect groundwater continue to evolve. States have revised and updated

Chemical Use



Proper management of chemicals used in industrial processes is critical to protecting human health and the environment. Fracturing fluids injected into wells during the hydraulic fracturing

process contain chemicals in a range of categories. The primary pathway through which chemicals used in natural gas production could interact with the environment is through spills of fracturing fluids or wastewater.

Stakeholders have asked for increased transparency on the chemicals used in hydraulic

requirements to address concerns and harness technological advances. Industry has developed extensive guidance on practices to protect water supplies. Many natural gas producers are also advancing innovative technologies and management practices. For example, some natural gas producers are working to increase reuse of water for completions onsite to reduce demands on local freshwater. Other producers are assessing alternative sources of water.

fracturing and more information on companies' overall approaches to managing chemicals. Most states have developed public disclosure laws that require companies to report the chemicals they use. The most commonly used disclosure database is FracFocus. Although most chemicals used in hydraulic fracturing fluid are identified publicly by producers, companies consider the use of certain chemicals to be proprietary information and do not release data on them. Some in the industry are also working to develop less hazardous substances that can substitute for chemicals currently found in fracturing fluids.

Community and Safety



A crucial component of any company's success is maintaining its social license to operate. Leading natural gas producers work with communities to better understand and address

concerns that come with increased industrialization of an area. The potential disruptions that gas development can bring to communities has led local populations and other stakeholders to increasingly seek information on industry efforts to

minimize impacts on communities. Increased truck traffic to transport heavy equipment and water is a common concern.

Safety is a core value across the natural gas industry. Natural gas production involves the use of heavy machinery, handling of chemicals, and work in potentially hazardous conditions. Stakeholders are interested in understanding what companies are doing to safeguard communities and workers.

¹⁸ Kondash, A. and A. Vengosh. "Water Footprint of Hydraulic Fracturing" *Environmental Science & Technology Letters*. 2015, 1, 276-280. Available at: <http://pubs.acs.org/doi/pdf/10.1021/acs.estlett.5b00211>

Table 3. Environmental and Social Performance Indicator Categories for Natural Gas Production

Topic Area		Environmental and Social Performance Indicators	
		Quantitative (Non-Financial)	Strategy
01	Methane and Air Emissions	What are the total methane emissions of your operations, and what is the methane emissions intensity of your operations?	What is your strategy for limiting methane emissions?
02	Water	<p>What are the sources of water for completions (hydraulic fracturing) at your operations by volume and percentage of total volume? For freshwater, what is the intensity of use?</p> <p>Do you conduct pre- and post-drill groundwater testing? What is the frequency and location?</p> <p>What were the number and volume of hydrocarbon and non-hydrocarbon spills to soil and water from your operations?</p>	<p>What is your strategy for managing freshwater use?</p> <p>What is your approach to well planning and strategy for maintaining well integrity?</p> <p>What is your strategy for managing water onsite and wastewater?</p>
03	Chemical Use	How do you measure progress on stewardship activities for hydraulic fracturing chemicals? Provide quantitative data.	What is your strategy for managing chemicals?
04	Community and Safety	<p>How do you measure progress on improving engagement with the communities that you operate in? Provide quantitative data.</p> <p>What were your recordable injury rate, fatality rate, and near miss frequency rate for employees and contractors?</p>	<p>What is your strategy for protecting and engaging with communities?</p> <p>What is your strategy for ensuring contractor health, safety, and environmental performance?</p>

Visit www.mjbradley.com/NGSC for additional background on NGSC and the environmental and social performance indicators.