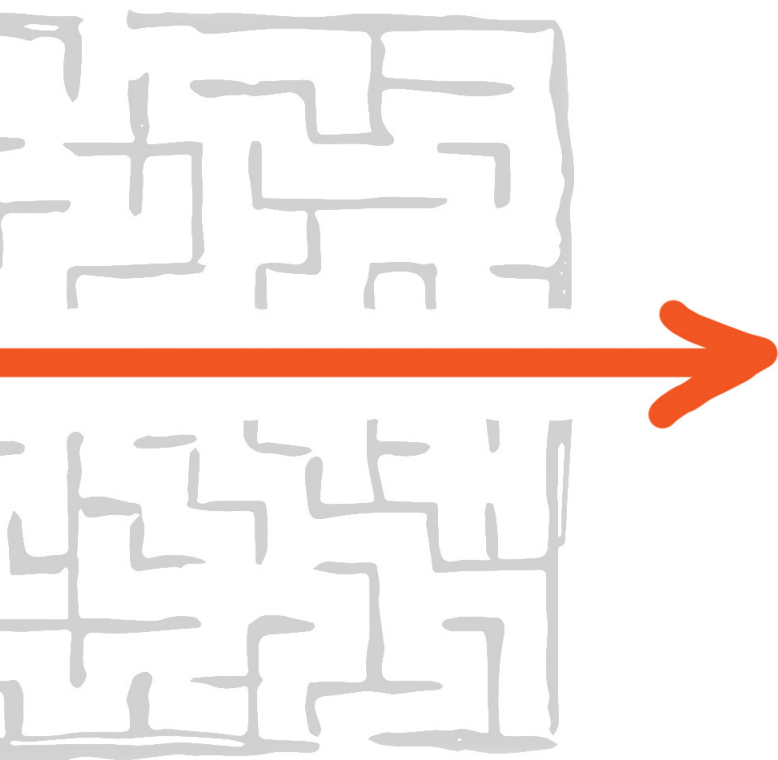


IN-DEPTH:

NATURAL GAS EXTRACTION

UPDATED MARCH 2020



GLASS LEWIS

Introduction

According to the International Energy Agency's Gas 2019 [report](#), natural gas demand grew 4.6%, its fastest annual pace since 2010. Gas accounted for 45% of the total increase in primary energy consumption worldwide, with the United States and China as the two main contributors to the increase due to economic growth, the transition from coal to gas, and above average weather-related energy needs. Though growth is unlikely to continue at this pace, consumption is expected to grow at an average annual rate of 1.6% to 2024, while industrial use of gas is forecast to grow at an average annual rate of 3% and represent 46% of the rise in global consumption to 2024. Gas in power generation, meanwhile, is expected to increase at a slower rate due to strong competition from renewables and coal. Still, power generation will remain the largest consumer of natural gas, accounting for nearly 40% of total demand by 2024.

In 2018, gas production in the U.S. [grew](#) by 11.8%, its fastest rate since 1951, making it the largest contributor to global gas production growth. The U.S. is also forecast to be the world's foremost LNG exporter in 2024. To meet demand, the U.S. has approximately one million [active wells](#), varying in output from 1 barrel of oil equivalent per day ("BOE/day") to 12,800 BOE/day, and, in 2018, there were approximately 140,000 active horizontal wells. While U.S. natural gas production is helping to meet global energy demand, there are some concerns about the environmental and health effects of fracking. In addition, state and federal regulations may further benefit or hinder U.S. production. Despite these concerns, it is likely that natural gas will continue to be an important aspect of U.S. energy production for the foreseeable future.

Hydraulic Fracturing

Hydraulic fracturing ("fracking") is a method used in "unconventional" natural gas production to extract gas from rock formations that would otherwise not be commercially viable. A mix of water, chemicals, and particles are injected under high pressure into a borehole to create openings in rock formations through which natural gas can flow to a well. The fracturing fluid then flows back up the borehole before being either stored on site, injected underground, or treated and discharged into surface water. According to a 2019 [report](#), the global market for fracking proppants reached a value of over \$7.4 billion in 2018 and is expected to reach a value of U.S. \$10 billion by 2024. A 2010 [report](#) produced for the American Petroleum Institute on the economic impacts of the Marcellus shale, a natural gas resource of "Middle East proportions" beneath the Appalachian Mountains, estimated the total value of recoverable assets from the Marcellus shale alone to be roughly \$2 trillion.

According to [FracFocus](#), up to 80% of the natural gas wells drilled in the next ten years will require fracking to remain operating. Further, gross withdrawals from shale gas wells [grew](#) by over 97% from 2013 to 2018. While shale gas production accounted for about half of total U.S. natural gas production at 37 Bcf/d in 2015, it is projected to nearly double by 2040, having already [reached](#) 69% of total U.S. dry natural gas production in 2018.¹ In 2017, these and other factors drove the U.S. to become a [net exporter](#) of natural gas.

Determining the Impact of Hydraulic Fracturing on Water Supplies

Much of the debate on hydraulic fracturing is about whether it presents a threat of water contamination. Industry representatives often cite a 2004 EPA [study](#) which concluded that fracking fluids injected into coalbed methane production wells pose minimal threat to underground sources of drinking water. However, the study was widely criticized as being unduly influenced by the industry and, shortly after its release, EPA environmental engineer

¹ "[Shale Gas Production Drives World Natural Gas Production Growth](#)," Energy Information Administration. August 15, 2016.

Weston Wilson wrote to Congress that its findings were “unsupportable,” noting conflicts of interest for five of the study’s seven peer reviewers, which included multiple oil company officials and employees.²

In 2016, the EPA released a [final report](#) on the impact of hydraulic fracturing on drinking water resources. The report stated that there were several avenues, both above and below ground, by which hydraulic fracturing could potentially affect groundwater reserves, with the effects ranging in severity from lowered water quality to contamination making drinking water non-potable. Despite this, the report concluded that the available data and information was not sufficient to report “the national frequency of impacts on drinking water from activities in the hydraulic fracturing water cycle... [and] precluded a full characterization of the severity of impacts.” The text of this conclusion is a departure from the statements made in the [draft report](#) from 2015, which stated that the EPA “did not find evidence that these mechanisms have led to widespread, systemic impacts on drinking water in the United States.” This was widely criticized by both the EPA’s internal Science Advisory Board and the wider scientific community. Nevertheless, the final version of the report indicated that “...cases of impact...” were identified in all stages of the fracking hydraulic cycle.³

Additionally, after a two-year impact study, the EPA [linked](#) chemicals from fracking to polluted groundwater in Pavillion, Wyoming.⁴ However, it may be that poorly built wells and not hydraulic fracturing itself are to blame for many cases of water contamination. Energy officials have said that, in those cases, wells weren’t properly sealed with subterranean cement, which allowed contaminants to travel up the well bore from deep underground into shallow aquifers that provide drinking water.⁵

To determine whether fracking negatively impacts drinking water and assess if it was appropriate to impose the Safe Drinking Water Act (“SDWA”) exemption for hydraulic fracturing operations, the U.S. House of Representatives Committee on Energy and Commerce requested information from 14 companies between February and May 2010, including:

- Documents showing the number of wells that the companies hydraulically fractured from 2005 to 2009;
- Recent data on the types and quantities of chemicals used in hydraulic fracturing fluids;
- Information on whether the companies injected these fluids in, near, or below an underground source of drinking water;
- Documents related to any allegations that the hydraulic fracturing caused harm to human health or the environment;
- Documents estimating the companies’ fluid recovery efficiency;
- Information on the chemical contents of water produced from hydraulic fracturing operations; and
- Information on how the companies disposed of this waste.

The committee [reported](#) the response to these letters, finding that, between 2005 and 2009, these companies used over 2,500 hydraulic fracturing products containing 29 chemicals that are “(1) known or possible human carcinogens, (2) regulated under the [SDWA] for their risks to human health, or (3) listed as hazardous air pollutants under the Clean Air Act.” Representative Henry Waxman urged the EPA and the Department of Energy to establish

² Mike Soraghan. “[Controversial Candidates on ‘Short List’ for EPA Fracking Panel.](#)” *New York Times*. September 20, 2010.

³ Briana Mordick. “[EPA Downplayed Risk to Water from Fracking Last Minute.](#)” *NRDC*. December 5, 2016.

⁴ Eyder Peralta. “[EPA Report Links Fracking to Water Pollution.](#)” *NPR*. December 8, 2011.

⁵ Russell Gold. “[Faulty Wells, Not Fracking, Blamed for Water Pollution.](#)” *The Wall Street Journal*. March 25, 2012.

protections to prevent such chemicals from entering drinking water supplies. Representative Diana DeGette referred to the content and quantity of toxic chemicals being injected into the ground as "deeply disturbing."

In August 2011, the SEC asked oil and gas companies to provide it with detailed information regarding the components of their fracking fluids and how they are minimizing water usage and the environmental impact of their fracking operations. The SEC's interest in this matter is to ensure that investors are being informed about the risks a company may face related to its operations, such as lawsuits, compliance costs, or other uncertainties. While the SEC requires companies to confidentially provide it with information, it does not currently require broad, standardized, or public disclosure of this information, though that may be subject to change.⁶ In Wyoming, however, companies are not required to disclose the contents of their fracking fluids. There, a district court judge sided with the state and Halliburton when she stated that such disclosure could be an economic disadvantage to a company because of the risk that its competitors could reverse-engineer its fracking fluids.⁷ This decision was reversed in 2015, resulting in a settlement that would force the Wyoming Oil and Gas Conservation Commission to adopt stricter standards for evaluating claims to keep certain chemicals hidden; however, a Wyoming district court claimed that enforcing this regulation exceeded the agency's authority, and it never officially took effect.⁸ Further, a state-sovereignty argument has been rallied against federal fracking legislation, and a 2017 bill introduced by Wyoming senators aims to supersede the federal legislation introduced under former President Obama.⁹ However, after a 2015 Obama Administration ruling, 26 states are now [reporting](#) fracking fluids using [FracFocus](#), the national hydraulic fracturing registry. On December 29, 2017, the Bureau of Land Management under the Trump administration officially [repealed](#) the federal laws designed to require oil and gas companies to disclose chemicals used in their operations, to manage fracking fluids that flow to the surface in an environmentally responsible way, and to properly construct wells to protect surrounding water supplies.¹⁰

State and Federal Water Contamination Regulations

The [Energy Policy Act of 2005 excluded](#) hydraulic fracturing from regulation under the [Safe Drinking Water Act's \("SDWA"\) Underground Injection Control \("UIC"\)](#) program, which regulates the subsurface emplacement of fluid. Because of the SDWA exemption, companies are not required to disclose chemicals used during fracking operations to the EPA. Thus, it is extremely challenging to determine if fracking operations are contaminating water supplies. However, the UIC does [regulate](#) the use of diesel fuel during fracking by mandating that service companies receive authorization prior to using it to perform hydraulic fracturing. According to the [EPA](#), shale gas wastewater contains high concentrations of total dissolved solids (salts), chemicals, metals, and technologically enhanced naturally occurring radioactive materials ("TENORM"). In an effort to preserve watersheds, the Clean Water Act ("CWA") prohibits on-site direct discharge of wastewater from shale gas extraction into U.S. waters. While much of the wastewater from shale gas extraction is disposed of by being reused or re-injected, a significant amount remains after utilizing such methods. As such, some wastewater is disposed of at public or private treatment plants that are unable to properly treat it, resulting in the discharge of pollutants into local waters.

In December 2016, the EPA finalized a ruling on shale wastewater treatment and discharge standards. The [ruling](#) addresses pollutant discharges into publicly owned treatment works from

⁶ Deborah Solomon. "[SEC Bears Down on Fracking.](#)" *The Wall Street Journal*. August 25, 2011.

⁷ Mead Gruver. "[Judge Sides with Wyoming in Fracking Chemical Suit.](#)" *Associated Press*. March 26, 2013.

⁸ Sarah Tory. "[Fewer Trade Secrets for Wyoming Fracking Fluid.](#)" *High Country News*. February 11, 2015.

⁹ Heather Richards. "[Fracking Bill May Increase States' Authority on Regulations.](#)" *Casper Star-Tribune Online*. February 10, 2017.

¹⁰ "[Trump Moves to Kill Rules for Fracking on Public Lands.](#)" *NRDC*. July 25, 2017.

onshore unconventional oil and gas extraction facilities. In May 2019, the EPA published for public comment a [draft](#) of its study of oil and gas extraction wastewater management under the Clean Water Act. As of the writing of this report, the EPA is [reviewing](#) the input it received during the comment period and will later finalize the study and announce next steps.

In July 2019, U.S. Representative Diana DeGette [introduced](#) legislation to close the loophole that excluded fracking from the Safe Drinking Water Act. The FRAC Act would require fracking companies to publicly disclose the chemicals they pump into the ground and would give the EPA the authority to regulate the process. In addition to the FRAC Act, four other bills were introduced simultaneously as part of the Frack Pack, including: i) the CLEANER Act, which would make oil and gas companies responsible for cleaning up and disposing of hazardous waste that results from their operations; ii) the FRESHER Act, which would mandate a study on the effects of stormwater runoff from oil and gas operations; iii) the BREATHE Act, which would decrease toxic air pollution that comes from oil and gas exploration and production; and iv) the SHARED Act, which would require testing for water contamination near fracking sites.

In the absence of comprehensive federal regulations regarding hydraulic fracturing wastewater disposal, several states have proposed their own regulations building on those of the CWA. These include proposals by the [New York State Department of Environmental Conservation](#), [Railroad Commission of Texas](#), and [Georgia](#). In December 2018, Oklahoma asked the EPA for permission to administer its own program to regulate the discharge of fracking wastewater. Meanwhile, Texas is using new state law [HB2771](#) to give officials until September 1, 2020 to ask the EPA for permission to run their own permitting program. Both states say they can remove toxic chemicals and reuse or recycle wastewater, though environmental groups warn that such technology hasn't been proven and cite concerns that, if given the requested authority, the states will likely discharge wastewater into rivers and streams.¹¹

Proposals and environmental assessments conducted by states to help them determine whether to allow hydraulic fracturing have received intense scrutiny from the public, environmental organizations, and industry groups.¹² Some states are optimistic that the energy industry will develop new waste management technologies that could quickly invalidate legally-recognized best practices.¹³

Glass Lewis Considerations

Glass Lewis recommends that shareholders take a close look at shareholder proposals regarding any aspect of hydraulic fracturing or other forms of natural gas extraction to determine whether the actions requested of a company will clearly lead to an increase in long-term shareholder value. We recognize the complexity of accurately gauging the potential risks to shareholder value with respect to natural gas extraction operations. Despite these challenges, however, we believe it is prudent for management to assess potential exposure to risks resulting from fracking and incorporate this information into its overall business risk profile.

In general, we believe companies should consider their exposure to:

Direct Risk:

Firms should consider the direct environmental and human health risks associated with fracking operations. While the degree to which hydraulic fracturing contaminates water supplies is still murky, it is prudent for firms to take appropriate precautions regarding their potential

¹¹ Paul Stinson. "[Texas, Oklahoma Want More Say in Handling Fracking Wastewater.](#)" *Bloomberg Environment*. August 15, 2019.

¹² Glenn Coin. "[New York State Inundated with Public Comments On Fracking.](#)" *syracuse.com*. February 20, 2012.

¹³ The Associated Press. "[Wastewater is Key Issue in New York Fracking Debate.](#)" *syracuse.com*. February 20, 2012.

environmental impact through, for example, ensuring proper well casing and taking appropriate safety precautions. In 2010, the EPA issued an emergency order charging Range Resources Corp., a Texas-based natural gas driller engaged in fracking, with contaminating two water wells with methane and benzene. The order gave the company 48 hours to provide residents with clean drinking water. While the EPA order mentions hydraulic fracturing, it did not explicitly link it with the contamination of the water supply.¹⁴

In addition, the *New York Times* has reported that, of 200 Pennsylvania wells tested in 2011, 42 exceeded the federal drinking water standard for radium, and several of the wells had levels of radium more than 1500 times above the federal limit.¹⁵ Of further concern, most drinking-water intake plants downstream from sewage treatment plants that accept drilling waste have not tested for radioactivity since before 2006.¹⁶ However, in January 2013, the Pennsylvania Department of Environmental Protection (“PADEP”) began a [study](#) on TENORMs, which concluded in January 2015. The study found that, while there is little exposure risk for the public from the use or extraction of natural gas, TENORM contaminants could pose a risk in the event fluids from extraction operations are spilled. The report also found that improper treatment of such fluids could create a risk of TENORM exposure. The report recommended that the areas around treatment plants be tested to see if there was increased radioactivity and that proper protocols be created to address the risks of spills, improper treatment, and long-term disposal issues.

A 2018 study examined the relationships between short-term and long-term exposures to fracking activity and county hospitalization rates for a variety of broad disease categories. The study used two 12-year panels, one with all 67 Pennsylvania counties and the other with 54 counties that excluded major metropolitan areas. The researchers found a positive association of cumulative well density with genitourinary hospitalization rates and skin-related hospitalization rates. Even when excluding large metropolitan areas, the positive relationship persisted. Researchers also found the association to be driven by females between ages 20 to 64 for kidney infections, calculus of ureter, and urinary tract infections. While the data suggests a connection, further research is required to determine the specific effects of fracking on public health.¹⁷

In September 2019, a water quality report by the Susquehanna River Basin Commission found that water quality scores at 14 of the 16 stations in the basin, which covers areas of Pennsylvania, Maryland, and New York, were in “good” or “excellent” categories. Natural gas developers in Pennsylvania hope the report will quell plans for a fracking ban currently being considered by neighboring Delaware River Basin Commission, which covers the Pennsylvania region bordering New Jersey. In May, Pennsylvania Governor Tom Wolf said he would support the ban, as did governors in New Jersey and Delaware, which are also covered by the Delaware River Basin Commission.¹⁸

In November 2019, Governor Wolf announced that his administration would spend \$3 million on two studies exploring the potential health impacts of the natural gas industry after months of pressure from the families of nearby pediatric cancer patients living in the most heavily

¹⁴ Mike Soraghan. “[EPA Action on Texas Natural Gas Driller Escalates Fight Over State Regulation.](#)” *New York Times*. December 8, 2010.

¹⁵ Jeremy White, Haeyoun Park, Ian Urbina, Griff Palmer. “[Toxic Contamination From Natural Gas Wells.](#)” *New York Times*. February 26, 2011.

¹⁶ Ian Urbina. “[Regulation Lax as Gas Wells’ Tainted Water Hits Rivers.](#)” *New York Times*. February 26, 2011.

¹⁷ A. Denham, M. Willis, A. Zavez, E. Hill. “[Unconventional Natural Gas Development and Hospitalizations: Evidence from Pennsylvania, United States, 2003-2014.](#)” *Public Health*. Vol. 168, pp.17-25. March 2019.

¹⁸ Steve Bittenbender. “[Natural Gas Developers Banking on Report to Prevent PA. Fracking Ban.](#)” *Pittsburgh Post-Gazette*. October 12, 2019.

drilled region of the state. Though there is no known environmental cause of the rare cancers dozens of children and young adults have been diagnosed with in a four-county area outside Pittsburgh, the families have been pressing for an investigation into any possible link between the cancer and shale gas development.¹⁹

Diesel fuel, which contains chemicals [known](#) to be carcinogenic and damaging to the central nervous system, liver, and kidneys, has been used in fracking operations as recently as 2007 and could potentially still be in use. Both Halliburton and BJ Services, two of the world's largest natural gas drilling companies, have acknowledged to Congress that they used diesel fuel in hydraulic fracturing as recently as 2007, in direct violation of a 2003 memorandum of agreement with the EPA agreeing to limit the amount of diesel fuel used in fracking. However, these companies have not indicated whether the fluids were injected into wells located in or near underground sources of drinking water.²⁰ In 2011, Congressional investigators wrote a letter to the EPA charging oil and gas companies with using tens of millions of gallons of diesel fuel in their fracking operations from 2005 to 2009, in violation of the Safe Drinking Water Act.²¹ Further, prior to a February 2014 EPA memorandum, kerosene was [absent](#) from the EPA's definition of 'diesel fuels'. From 2010 to 2014, at least 351 wells, fracked by 33 different companies, were identified by the Environmental Integrity Project as using 'diesel' fluids, including kerosene.²² Therefore, as a result of a lapse in the EPA's diesel classification, fracking companies were able to avoid the diesel ban while using a similarly toxic fuel instead. The EPA responded in 2017 by issuing revised [guidance](#) that includes clarification regarding its use of the term "diesel fuels."

According to a 2009 [report](#) from the U.S. Department of Energy, the amount of water required for fracturing activity is also incredibly demanding on water supply. On average, each well will use three million gallons of water over the course of its lifetime. In arid regions, hydraulic fracturing could require a 30% increase in groundwater extraction.²³ In water-stressed regions such as the Barnett Shale in Texas, this could mean that the expansion of hydraulic fracturing would be hydrologically [unsustainable](#). In fact, a Ceres report indicates that 92% of Colorado wells are in extremely high water stress regions and 51% of Texas wells are in high or extremely high water stress locations.²⁴ Moreover, 30% of shale deposits are located in arid regions where aquifers are already being heavily stressed by irrigated crops and 31-40% of shale deposits are in areas where water stress would emerge or be exacerbated by fracking.²⁵ While the process of hydraulic fracturing 'produces' water previously locked in underground formations, only 50-70% is actually recovered.²⁶

Drilling in the Permian basin currently produces more than 1,000 Olympic-size swimming pools full of wastewater per day.²⁷ Because fracking only recovers about 8-10% of oil in shale, the industry is heavily incentivized to increase the oil recovery rate. One of the ways that firms can extract more oil is by using additional water and sand. According to IHS Markit, companies have more than doubled the water and sand inputs required to extract oil since 2014. Small

¹⁹ ["Pennsylvania to Spend \\$3M to Study Possible Link Between Fracking and Spike in Childhood Cancer."](#) CBS Pittsburgh/Associated Press. November 22, 2019.

²⁰ Mike Soraghan. ["Two Oil-Field Companies Acknowledge Fracking With Diesel."](#) New York Times. February 19, 2010.

²¹ Tom Zeller Jr. ["Gas Drilling Technique Is Labeled Violation."](#) New York Times. January 31, 2011.

²² Naveena Sadasivam. ["Drillers Illegally Using Diesel Fuel to Frack."](#) Scientific American. August 15, 2014.

²³ Bobby Magill, Climate Central. ["Water Use Rises as Fracking Expands."](#) Scientific American. July 1, 2015.

²⁴ Mindy Lubber. ["Escalating Water Strains In Fracking Regions."](#) Forbes. Forbes Magazine, May 28, 2013.

²⁵ Larry O'hanlon. ["New Study Examines Impacts of Fracking on Water Supplies Worldwide."](#) Phys.org. June 11, 2018.

²⁶ Vera Köster. ["What is Shale Gas? How Does Fracking Work?"](#) ChemistryViews. February 5, 2013.

²⁷ Christopher M. Matthews. ["The Next Big Bet in Fracking: Water."](#) The Wall Street Journal. August 22, 2018.

earthquakes can result from too much water being pumped back into shale, and the Permian basin has experienced a recent uptick in these tremors.³⁷

Several studies have shed light on the link between hydraulic fracturing and induced earthquakes, i.e. earthquakes that are caused by human activities. An article in *Seismological Research Letters* states that “[m]ost induced earthquakes in the United States are a result of the deep disposal of fluids (waste-water) related to oil and gas production.”²⁸ The U.S. Geological Survey (“USGS”) [confirms](#) this link and [explains](#) that the injected wastewater counteracts the frictional forces on naturally occurring faults, effectively prying them apart and increasing the likelihood of earthquakes. An article published in *Science Magazine* also links increased earthquake rates in mid-continent U.S. starting in 2009 with the proliferation of wastewater from fluid injection wells, particularly high-rate injection wells.²⁹ The USGS further [states](#) that seismicity can be “induced at distances of 10 miles or more away from the injection point and at significantly greater depths than the injection point.” In a February 2016 finding from the Pennsylvania Department of Environmental Protection, fracking was determined to be linked to a 2016 series of small earthquakes. Similarly, after earthquake rates near Pecos, TX jumped from about two per year in 2008 to more than 1,400 in 2017, two studies led by researchers at the University of Texas Institute for Geophysics and Southern Methodist University attributed the increase of earthquakes to fracking, speculating that the tremors could intensify as production accelerates.³⁰

Fracking has also been specifically linked to earthquakes in Ohio, Oklahoma, Canada, and England.³¹ In February 2018, the Oklahoma Corporation Commission’s Oil and Gas Conservation Division and the Oklahoma Geological Survey issued a protocol including more stringent requirements for fracking operators to respond to the potential for induced seismological events.³²

Regulatory Risk:

Companies with hydraulic fracturing operations are subject to federal, state, and international regulations that could present significant risks to their operations. Hydraulic fracturing regulations exist at the state level, up to and including the complete banning of the practice. For example, in 2012, Vermont was the first state to ban fracking, while Maryland instituted its own ban on fracking on April 4, 2017.³³ New York also [banned](#) hydraulic fracturing in 2015 following a seven-year [study](#) on the practice by the state’s Department of Environmental Conservation.

California’s stricter regulations on fracking went into full effect in 2015 and include increased monitoring of water use and disclosure of chemicals used during the process.³⁴ In November 2019, California governor Gavin Newsom instituted new fracking regulations, including:

- i) subjecting new permits for fracking to independent scientific review by experts at the Lawrence Livermore National Laboratory;

²⁸ Justin L. Rubinstein, Alireza Babaie Mahani. “[Myths and Facts on Wastewater Injection, Hydraulic Fracturing, Enhanced Oil Recovery, and Induced Seismicity.](#)” *Seismological Research Letters*. Vol 86(4), pp. 1060-1067. 2015.

²⁹ M. Weingarten, S. Ge, J.W. Godt, B.A. Bekins, J.L. Rubinstein. “[High-Rate Injection is Associated with the Increase in U.S. Mid-Continent Seismicity.](#)” *Science Magazine*. Vol 348(6241), pp. 1336-1340. June 19, 2015.

³⁰ Anna Kuchment. “[Fracking May Indeed Be Causing Earthquakes in Texas, According to UT Study.](#)” *The Dallas Morning News*. November 11, 2019.

³¹ Laura Legere. “[DEP Links Lawrence County Earthquakes to Fracking.](#)” *Pittsburgh Post-Gazette*. February 16, 2017.

³² Jack Money. “[Regulators Tighten Rules to Control Fracking-Related Earthquakes in Central, Northwest and South-Central Oklahoma.](#)” *The Oklahoman*. February 28, 2018.

³³ The CNN Wire Staff. “[Vermont First State to Ban Fracking.](#)” *CNN*. May 17, 2012.

³⁴ Julie Cart. “[State Issues Toughest-in-the-Nation Fracking Rules.](#)” *Los Angeles Times*. July 1, 2015.

- ii) auditing of the permit process by the state Department of Finance;
- iii) a moratorium prohibiting new underground oil-extraction wells from using a high-pressure cyclic steaming process; and
- iv) rules regarding public safety and proximity of oil and gas activities to homes, schools, hospitals, and parks.³⁵

The changes occurred after a series of uncontrollable crude petroleum releases from Chevron wells in Kern County began in May and continue as of the writing of this report.³⁶

The Illinois Department of Natural Resources also published rules regulating fracking in 2014 that continue to face legal challenges.³⁷ The state's first fracking permit was issued to Kansas-based Woolsey Companies Inc. in September 2017, but Woolsey declined to use it, citing Illinois's burdensome and costly regulations, in addition to unfavorable market conditions.³⁸

More recently, in March 2019, the Florida state senate passed a bill that includes a partial ban of fracking. If signed by the governor, the bill would prevent companies from using hydraulic and acid fracking but would allow another type known as matrix acidization. Unlike the other fracking techniques, matrix acidization does not involve pumping high-pressure liquids underground to free trapped gas and oil. Instead, matrix acidization uses a low-pressure acidic solution to erode underground limestone and create channels for gas and oil to flow. Opponents of the bill argue that matrix acidization can still contaminate ground water and cause other forms of environmental damage. Meanwhile another bill has been introduced that would ban all forms of fracking in Florida.³⁹

In New Mexico, a pending bill would create a four-year moratorium on any new state permits for hydraulic fracturing and would require the energy and minerals agency to provide an annual report including the number of permits with active fracking, greenhouse gas trends, the status of funding for fracking research, and information on any impacts from fracking operations. The bill also outlines public health reporting requirements, reporting requirements for the New Mexico Indian Affairs Department, and a reporting mandate regarding worker compensation claims for injuries among workers involved with fracking.⁴⁰ A similar bill was introduced in the 2020 legislative session.⁴¹

In response to links between induced seismicity and wastewater injection, many state regulatory agencies, notably the [Oklahoma Corporation Commission](#) and the [Railroad Commission of Texas](#), proposed stricter rules on wastewater injection. In Arkansas and Ohio, wells have been shut down and stricter rules have been proposed prior to the issuance of new injection-well permits.⁴² In addition, fracking regulations have emerged at the local level, though some have been met with legal challenges. For example, the city of Denton, Texas

³⁵ Richard Gonzales. "[California Governor Cracks Down on Fracking, Requires Audits and Scientific Review.](#)" *NPR*. November 19, 2019.

³⁶ Ted Goldberg, Dan Brekke. "[State Puts Hold on Some Oil Well Permits After Chevron's Kern County 'Crisis.'](#)" *KQED*. November 19, 2019.

³⁷ Julie Wernau. "[Fracking Rules for Illinois Published After Long Battle.](#)" *Chicago Tribune*. November 14, 2014.

³⁸ Max B. Baker. "[Denton City Council Repeals Fracking Ban.](#)" *Fort Worth Star-Telegram*. June 16, 2015.

³⁹ Scott Powers. "[Senate Panel Passes Partial Ban Of Fracking Bill.](#)" *Florida Politics*. March 11, 2019.

⁴⁰ Rebecca Moss. "[N.M. Gas, Oil Industry Booming; Proposal to Freeze Fracking Permits Until 2023 Surfaces.](#)" *Las Cruces Sun News*. February 5, 2019.

⁴¹ Adrian Hedden. "[New Mexico Lawmaker Proposed Fracking Ban, Added Reporting That Could Cost State Billions.](#)" *Carlsbad Current Argus*. January 15, 2020.

⁴² Jim Efstathiou Jr. "[Fracking-Linked Earthquakes Spurring State Regulations.](#)" *Bloomberg*. April 20, 2012.

banned fracking in a city referendum in 2014. However, passage of House Bill 40 by the Texas state legislature in 2015 made local fracking bans illegal, which forced the Denton City Council to repeal the ban.⁴³ Similarly, local fracking bans in Ohio were invalidated by the Ohio Supreme Court, which ruled that the authority to regulate oil and gas drilling activities lies with the state.⁴⁴

In Colorado, a proposed amendment to the state's constitution that would have given municipalities unique autonomy regarding fracking operations did not come to a vote in 2014.⁴⁵ This and other related failed ballot initiatives prompted anti-fracking groups to begin planning to reintroduce the issue for the 2016 election cycle.⁴⁶ The amendment, referred to as the Community Rights Amendment, would have allowed each "county, city, town or other 'municipal subdivision'" to enact "laws that protect 'health, safety and welfare' [of] residents" including those related to fracking and mining.⁴⁷ However, the 2016 measures did not garner enough signatures to make the ballot.⁴⁸ Furthermore, due to legal challenges stemming from Longmont's 2013 ban and Fort Collins' moratorium on fracking, the measures went to the Colorado Supreme Court for a ruling on the issue of whether local governments can impose stricter regulations for oil and gas than the state.⁴⁹

The court struck down the measures, asserting that state law did indeed have precedence over the local governments' actions.⁵⁰ However, in November 2018, a new proposition was voted on in Colorado that would mandate that new oil and gas development projects be a minimum distance of 2,500 feet from areas designated "vulnerable," including playgrounds and parks, public open spaces, and bodies of water.⁵¹ Months after the defeat of this proposition, Colorado governor Jared Polis debuted what was referred to as "the most sweeping oil and gas reform the state has ever seen."⁵² Senate Bill 181 [made](#) human health and environmental protection the state's priority, rather than energy production, by giving local governments the authority to fine operators for leaks, spills, and emissions, while also allowing them to impose fees and regulate noise.⁵³ In October 2019, Colorado officials stated that they would toughen oversight of oil and gas drilling and fracking sites following the release of a multi-year [study](#) that found industry operations may expose residents to unhealthy levels of benzene and other chemicals that cause elevated risk of short-term health impacts. State regulators said they would

⁴³ Max B. Baker. "[Denton City Council Repeals Fracking Ban.](#)" *Fort Worth Star-Telegram*. June 16, 2015.

⁴⁴ Ann Sanner, Associated Press. "[Ohio Secretary of State Defends Move to Invalidate Ballot Issues.](#)" *The News-Herald*. September 4, 2015.

⁴⁵ "[Colorado Right to Local Self-Government Amendment \(2014\)](#)" *Ballotpedia*. 2014.

⁴⁶ Joey Bunch. "[Fracking Foes Unveil 11 Proposed Colorado Ballot Initiatives, Including a Ban.](#)" *The Denver Post*. December 23, 2015.

⁴⁷ Ernest Scheyder. "[Oil Producers Undaunted As Colorado Mulls Fracking Restrictions.](#)" *Reuters*. March 2, 2014.

⁴⁸ Amy Harder, Erin Ailworth. "[Fracking Measures Won't Go Before Colorado Voters in November.](#)" *The Wall Street Journal*. August 29, 2016.

⁴⁹ Bruce Finley. "[Colorado High Court Hears Cases on City Oil and Gas Fracking Bans.](#)" *Denver Post*. December 9, 2015.

⁵⁰ Grace Hood. "[Colorado Supreme Court Rules Against Cities' Fracking Limits.](#)" *Colorado Public Radio*. May 2, 2016.

⁵¹ "[Colorado Proposition 112, Minimum Distance Requirements for New Oil, Gas, and Fracking Projects Initiative \(2018\)](#)." *Ballotpedia*. 2018.

⁵² Judith Kohler. "['Most Sweeping Oil and Gas Reforms' in Colorado History Proposed by State Legislators.](#)" *The Denver Post*. February 28, 2019.

⁵³ Jennifer Kovaeski, Nicole Brady. "[Bill Overhauling Oil and Gas Regulation Gets First hearing Tuesday After Competing Rallies.](#)" *The Denver Channel*. March 5, 2019.

immediately begin reviewing all industry applications to drill new wells within 2,000 feet of homes more strictly and start measuring air emissions around industry sites.⁵⁴

Accordingly, companies have an even stronger mandate to ensure community approval and support of potential projects. The number of jurisdictions temporarily banning, considering, or passing legislation that would delay or restrict hydraulic fracturing operations indicates that companies may face significant state-level regulatory risks or local opposition.

On a federal level, the Obama Administration both proposed and finalized rules relating to hydraulic fracturing in 2015. In March 2015, the BLM [released final rules](#) regarding hydraulic fracturing on public and American Indian lands, which took effect in June 2015. According to a press release, key provisions of the BLM standards included: (i) provisions for ensuring the protection of groundwater supplies by requiring a validation of well integrity and strong cement barriers between the wellbore and water zones through which the wellbore passes; (ii) increased transparency by requiring companies to publicly disclose chemicals used in hydraulic fracturing to the BLM through the website FracFocus within 30 days of completing fracturing operations; (iii) higher standards for interim storage of recovered waste fluids from hydraulic fracturing to mitigate risks to air, water, and wildlife; and (iv) measures to lower the risk of cross-well contamination with chemicals and fluids used in the fracturing operation by requiring companies to submit more detailed information on the geology, depth, and location of preexisting wells to afford the BLM an opportunity to better evaluate and manage unique site characteristics. However, the new standards did not remain in effect long as a federal judge in Wyoming granted a [preliminary injunction](#) against these rules. In response, the BLM filed an appeal to the Tenth Circuit, but it was struck down.^{55,56} After the repeal of the rules was passed in the House, it was defeated in the Senate in May 2017. By July 2017, the United States Court of Appeals for the District of Columbia Circuit ruled that the EPA could not suspend the former administration's methane regulations.⁵⁷ The following month, it issued another ruling indicating that the EPA must enforce the regulations.⁵⁸

Ultimately, the long-entrenched debate about state rights vs. federal rights may play a pivotal role in the next few years of fracking regulation. In February 2017, Wyoming senators John Barrasso and Mike Enzi introduced a bill designed to give priority to state fracking regulations over federal regulation. Conservationists argue that federal regulation is crucial to ensuring that states do not roll back on the significant progress made over recent years to reduce flaring and improve industry-wide reporting of fracking fuels. In contrast, proponents of the bill argue that it would reduce delays in the permitting process because of overlapping state and federal legislation.⁵⁹

Additionally, at the federal level, the Trump administration finalized plans in October 2019 to open hundreds of thousands of acres of land in Central California to oil and gas leasing, approved by the Bureau of Land Management ("BLM") after it determined that none of the more than 400 objections to the proposed leasing plan were valid. The plan could result in up to 37 new oil and gas wells drilling over the next 20 years. The BLM is also considering a proposal to conduct new oil and gas development on 1.6 million acres of public land in Southern

⁵⁴ Bruce Finley. "[Colorado to Tighten Oversight of Oil and Gas Sites near Homes in Wake of Study Finding Possible Short-Term Health Effects.](#)" *The Denver Post*. October 17, 2019.

⁵⁵ Hannah Sheehan. "[Industry Wants BLM's Appeal of Fracking Rule Stay Tossed.](#)" *Law360*. February 11, 2016.

⁵⁶ Stan Parker. "[BLM Had Authority to Craft Fracking Rule, 10th Circ. Told.](#)" *Law360*. August 15, 2016.

⁵⁷ Lisa Friedman. "[Court Blocks E.P.A. Effort to Suspend Obama-Era Methane Rule.](#)" *New York Times*. July 3, 2017.

⁵⁸ Rene Marsh. "[EPA Ordered to Enforce Obama-Era Methane Pollution Rule.](#)" *CNN*. August 1, 2017.

⁵⁹ Heather Richards. "[Fracking Bill May Increase States' Authority on Regulations.](#)" *Casper Star-Tribune Online*. February 10, 2017.

California.⁶⁰ In response, California sued the Trump administration in January 2020, alleging that the BLM failed to adequately consider the adverse environmental and social effects that drilling would have in eight Central California counties.⁶¹ Meanwhile, 2020 presidential candidate Senator Bernie Sanders of Vermont introduced a bill to ban hydraulic fracturing in the country altogether.⁶²

Some companies involved in fracking operations are supportive of additional regulation. For example, Royal Dutch Shell's former CEO, Peter Voser, has advocated regulation requiring the disclosure of fracking fluids and has said that his company disclosed chemicals used in fracking operations "to the extent permitted under [its] supplier contracts." Voser stated that poorly designed wells are the cause of problems related to fracking, not the technique itself: "[w]hen a well is designed and constructed correctly, groundwater will not be contaminated."⁶³ Chevron's former CEO, John Watson, agreed that the companies must address the "legitimate concerns" associated with fracking through implementation of stricter standards. Watson further noted that "[p]ublic expectations are very high, and there's no reason they shouldn't be high." Watson believes that there are clear risks, some of which are overstated and all of which are worth dealing with.⁶⁴

Global Regulatory Risk:

Regulatory concerns over fracking also exist outside of the United States. Following failed attempts by the European Union to set legally binding fracking regulations, on January 2014, the European Commission [adopted a recommendation](#) urging its member states to follow non-binding principles when conducting hydraulic fracturing to encourage safeguarding of the environment, climate, and public health.

Many countries have considered banning hydraulic fracturing altogether. In June 2011, France became the first country to ban hydraulic fracturing.⁶⁵ In January 2012, Bulgaria enacted a ban on fracking operations, effectively invalidating Chevron's gas exploration permit in the region. Bulgaria's neighbor, Romania, has also considered placing a moratorium on fracking.⁶⁶ Though officially unexplained, Chevron announced that it was relinquishing its last concessions in the country, potentially because of the vigorous opposition and weak results fracking operations have encountered there.⁶⁷ Neighboring Germany had a de facto moratorium on fracking for several years until it banned fracking outright by law in June 2016.⁶⁸

Further, in April 2011, South Africa imposed a moratorium on the issuance of new licenses for drilling exploration after growing concerns regarding potential impacts on the rural, farming communities in the Karoo region, where water is scarce.⁶⁹ However, in 2012, the moratorium was lifted after a study lessening concern over the potential environmental impacts was released. In June 2015, South Africa published its [Regulations for Petroleum Exploration and Production](#) with the intent to "augment the Mineral and Petroleum Resources Development Regulations, so as to prescribe standards and practices that must ensure the safe exploration

⁶⁰ Emily Cadei. "[Trump Opening California Public Land to Fracking. Gas Leases. Is It 'Reckless'?](#)" *The Sacramento Bee*. October 5, 2019.

⁶¹ Nichola Groom. "California Sues Trump Administration Over Drilling Plan." *Reuters*. January 17, 2020.

⁶² Rachel Frazin. "[Sanders Introduces Bill to Ban Fracking.](#)" *The Hill*. January 30, 2020.

⁶³ Angel Gonzalez. "[Shell CEO: Gas, U.S. Oil Improve Energy Outlook.](#)" *MarketWatch*. March 7, 2012.

⁶⁴ Shan Li. "[Chevron CEO: Industry Must Address 'Legitimate Fracking' Concerns.](#)" *Los Angeles Times*. June 11, 2013.

⁶⁵ Tara Patel. "[France Outlaws 'Fracking' Shale for Natural Gas, Oil.](#)" *Bloomberg*. January 1, 2011.

⁶⁶ Palko Karasz. "[Shale Gas Search Divides Romania.](#)" *New York Times*. April 22, 2012.

⁶⁷ Selina Williams. "[Chevron to Give Up Romanian Shale-Gas Interests.](#)" *The Wall Street Journal*. February 20, 2015.

⁶⁸ Agence France-Presse. "[German Government Agrees to Ban Fracking After Years of Dispute.](#)" *The Guardian*. June 24, 2016.

⁶⁹ Ian Urbina. "[Hunt for Gas Hits Fragile Soil, and South Africans Fear Risks.](#)" *The New York Times*. December 30, 2011.

and production of petroleum.” The case of South Africa is illustrative of the overall debate on hydraulic fracturing: balancing economic opportunities against potential environmental and social impacts.

Australian states are currently divided about how to address concerns regarding hydraulic fracturing. Victoria instituted its existing moratorium on fracking in 2012 and New South Wales previously placed limits on fracking in its region.⁷⁰ However, Buru Energy began its fracking operations in the Kimberley region in Western Australia in 2015.⁷¹ Moreover, energy companies hoping to drill in Australia face a unique situation not typically present in the United States. In Australia, unlike in the United States, the rights to onshore oil and gas are owned by the state government, not private individuals. In these cases, companies may receive permission to drill from the state government, albeit heavily restricted permission. For example, the government of Australia’s Northern Territory placed a [moratorium](#) on fracking in September 2016 pending the completion of a report from an independent scientific group. In April 2018, the government announced that it would lift the moratorium and fully implement the recommendations from the scientific inquiry.⁷² Nevertheless, the [report](#) found that “[f]or a significant majority of the people participating in the Inquiry, the overwhelming consensus was that hydraulic fracturing for onshore shale gas in the NT is not safe, is not trusted and is not wanted.” Moreover, shareholders [submitted](#) a resolution at Australia’s Origin Energy in 2018 over concerns that it was not properly obtaining the consent of Indigenous Peoples prior to operating in the Northern Territory. A similar proposal was [submitted](#) to Origin the following year.

Similar to Australia, in the UK, the rights to all petroleum resources are held by the Crown, and the government regulator [issues](#) licenses to operators allowing them to explore for and extract the reserves. However, even following this permission, a company may still face public resistance and reputational risks from local farmers who actually own the land.⁷³

The UK lifted its ban on fracking in 2012, subject to new controls meant to mitigate the risks of seismic activity.⁷⁴ However, both Scotland and Wales issued moratoria on the practice in early 2015. Wales expressed that the British government’s push for energy development was premature given the uncertainty regarding the risks posed by fracking, and further agreed that the bans would be reconsidered after a full examination of health and environmental impacts is completed.^{75, 76} In April 2015 the [Oil and Gas Authority](#), a new executive agency of the Department of Energy and Climate, was [created](#) in order to regulate offshore and onshore oil and gas licensing in the UK. That same year saw the [release](#) of [draft regulations](#) that delineate areas protected from hydraulic fracturing. Additionally, in 2015 the UK government [introduced](#) the Infrastructure Act to simplify the process for obtaining the right to use underground land and allow local people to buy a stake in renewable energy projects. Ireland’s Parliament voted to ban fracking in June 2017, and the Scottish government also effectively banned fracking in October of that year.⁷⁷

Seven years after UK shale gas developer Cuadrilla made its first fracking attempt that led to small earthquakes, protests, and new regulations, the government signaled in October 2018

⁷⁰ Kate Galbraith. “[Australia Divided on Fracking](#).” *New York Times*. January 22, 2014.

⁷¹ Glenn Cordingley. “[Buru Completes Kimberley Fracking](#).” *The West Australian*. September 10, 2015.

⁷² Georgia Hitch, Sara Everingham. “[Fracking Set to Resume in the Northern Territory as Moratorium Lifted](#).” *ABC*. April 16, 2018.

⁷³ Kate Galbraith. “[Australia Divided on Fracking](#).” *New York Times*. January 22, 2014.

⁷⁴ Selina Williams. “[U.K. Lifts Shale Ban](#).” *Wall Street Journal*. December 13, 2012.

⁷⁵ “[Block on Fracking in Scotland Announced By Minister](#).” *BBC News*. January 28, 2015.

⁷⁶ Karolin Schaps. “[Wales Votes Against Shale Gas Fracking](#).” *Reuters- UK Focus*. February 4, 2015.

⁷⁷ Craig Bennett. “[Ireland Is the Latest European Country to Ban Fracking – the Tories Need to Follow Suit](#).” *The Independent*. June 4, 2017.

that the company could restart its fracking operations.⁷⁸ Cuadrilla's reemergence was again met with protests, leading to the arrest and sentencing of three men who were given 15 months for causing a public nuisance.⁷⁹ Their sentences were ultimately reversed by the court of appeal after they had been in custody for two weeks, having been cited as being "excessive and extraordinary" for peaceful protestors.⁸⁰

In August 2019, Cuadrilla suspended operations at Blackpool in Lancashire after triggering the UK's largest quake caused by fracking.⁸¹ A few days later, the OGA indefinitely [suspended](#) operations at the site. Concurrent with a November 2019 [report](#) from the OGA which determined that it would not be able to predict the likelihood of tremors associated with fracking, the British government banned fracking altogether. According to the government, its position will be maintained "unless compelling new evidence is provided."

Legal Risk:

Many companies with fracking operations have faced legal action due to water contamination. Between 2009 and 2012, there were 23 cases involving hydraulic fracturing filed by landowners. For example, Chesapeake Energy Corporation settled a lawsuit by paying \$15,000 to two Texas landowners who claimed the company polluted their well in December 2011 and, under an agreement with Pennsylvania regulators, Cabot Oil & Gas has established a \$4.1 million fund for 19 families with polluted water wells.⁸² In 2015, the Pennsylvania Department of Environmental Protection [reached](#) penalty agreements with three natural gas companies, including subsidiaries of Chesapeake and Exxon Mobil, for contamination of drinking water wells due to methane gas diffusion.

In December 2013, the EPA and Department of Justice [imposed](#) a \$3.2 million civil penalty against Chesapeake Appalachia, LLC, a subsidiary of Chesapeake Energy Corporation, for its unpermitted discharge of fill material into streams and wetlands at the company's West Virginia hydraulic fracturing sites. The fine was one of the largest ever levied by the federal government for a violation of the Clean Water Act, even excluding the EPA-estimated \$6.5 million the company was also to spend restoring the 27 damaged sites and implementing a new CWA compliance plan.

Further, the Pennsylvania Supreme Court ruled in December 2013 that portions of the state's Marcellus Shale drilling law of 2012, which allowed gas companies to drill anywhere in the state, were unconstitutional. The court reasoned that the law placed too many restrictions on the municipalities' rights because it permitted companies to drill without regard for local zoning laws.⁸³ The court's ruling in *Robinson v. Commonwealth* also included review of the drilling law's provision that banned doctors from informing patients of the health effects of shale gas development.⁸⁴ Three years later, the ban and other parts of Act 13, the state's revised oil and gas law, including eminent domain for natural gas storage facilities, and the exclusion of private wells from notification of hazardous spills were declared unconstitutional.⁸⁵

⁷⁸ Sabina Zawadzki. "[Gas Fracking to Start in England Next Week After Seven-Year Halt.](#)" *Reuters*. October 5, 2018.

⁷⁹ Frances Perraudin. "[Blackpool Activists Jailed for Anti-Fracking Protest.](#)" *The Guardian*. September 26, 2018.

⁸⁰ Damien Gayle, Frances Perraudin, and Owen Bowcott. "[Fracking Protestors Walk Free After Court Quashes 'Excessive' Sentences.](#)" *The Guardian*. October 17, 2018.

⁸¹ Jillian Ambrose. "[Cuadrilla Halts Work After UK's Biggest Fracking Tremor.](#)" *The Guardian*. August 22, 2019.

⁸² Jim Snyder. "[Tainted-Well Lawsuits Mount Against Gas Frackers Led by Cabot.](#)" *Bloomberg*. January 30, 2012

⁸³ Marie Cusick. "[Pennsylvania Supreme Court Strikes Down Controversial Portions of Act 13.](#)" *State Impact NPR*. December 19, 2013.

⁸⁴ Don Hopey. "[Pennsylvania Supreme Court Declares Portions of Shale-drilling Law Unconstitutional.](#)" *Pittsburgh Post-Gazette*. December 19, 2013.

⁸⁵ Susan Phillips. "[PA Supreme Court Rules with Environmentalists Over Remaining Issues in Act 13.](#)" *State Impact NPR*. September 28, 2016.

In the past several years, the PADEP levied fines against companies involved in natural gas related incidents. Specifically, Chevron faced a \$940,000 fine from the PADEP for multiple violations involving an explosion at a natural gas well site in Greene County, Pennsylvania.⁸⁶ The explosion, which was determined by state investigators to be caused by human error, led to the death of a contractor, resulting in Chevron paying \$5 million to the family of the victim to settle a wrongful death lawsuit.⁸⁷ Furthermore, on May 11, 2015, the PADEP issued an \$8.9 million fine against Range Resources, claiming the company's failure to fix a cement job on a natural gas well resulted in groundwater pollution. The fine, which Range Resources appealed, is the highest fine ever issued by the PADEP. Roughly a year later, John Quigley, the PADEP Secretary at the time the fine was issued, was forced out and the issue was settled without Range Resources paying any reparations.⁸⁸ In June 2019, a legal settlement between Range Resources and other defendants and three Washington County, PA families became public due to a computer error. The August 31, 2018 [document](#) shows that the defendants agreed to pay \$3 million to the plaintiffs who alleged that fracking activities had contaminated their properties and made them sick. The suit also alleges that Range Resources and two contracted laboratories manipulated test results to obscure their findings.⁸⁹ In addition, Statoil was levied a \$223,000 fine by the Ohio Environmental Protection Agency due to a fire at a natural gas fracking well which led to loss of wildlife.⁹⁰

In addition to water pollution, seismic activity is another byproduct of fracking operations that has the potential to expose the industry to legal risk. Parts of Oklahoma now have the same earthquake risk as California, with [studies](#) blaming fracking wastewater injection for the shift.⁹¹ Following a string of earthquakes in Oklahoma over the past few years, including a magnitude 5.8 incident near Pawnee, Oklahoma, energy companies must now account for legal risk resulting from fracking-induced seismic activity. In June 2015, a landmark Oklahoma Supreme Court ruling determined that homeowners could sue oil and gas companies for earthquake damages resulting from fracking activities.⁹² Following this 2015 ruling, Sierra Club and Public Justice [filed](#) a federal lawsuit against New Dominion, Chesapeake Operating, and Devon Energy Production Company requesting that the companies limit the amount of production wastewater injected into the earth. Further, the suit requests that the companies reinforce vulnerable structures and establish independent earthquake monitoring and prediction centers. In April 2017, the suit was dismissed without prejudice after the Oklahoma Corporation Commission took steps to implement a volume reduction plan for several dozen wastewater disposal wells, prompting the court to determine that the lawsuit need not move forward.⁹³

Additionally, an October 2015 leak from a natural gas storage well in Aliso Canyon near Los Angeles led to a number of lawsuits to be filed against Southern California Gas Company ("SoCalGas"). The leak caused massive amounts of methane to be released, affecting nearby Porter Ranch residents who complained of health problems including nausea, headaches, and nosebleeds most likely due to exposure to mercaptans, odorants added to methane to aid detection. A class action suit was filed by the residents and seeks an unspecified amount of

⁸⁶ Katie Colaneri. "[DEP Fines Chevron \\$940K for Fatal Gas Well Fire.](#)" *State Impact NPR*. June 1, 2015.

⁸⁷ David DeKok. "[Chevron Pays Reported \\$5M to Family of Pennsylvania Well Fire Victim.](#)" *Reuters*. May 29, 2015.

⁸⁸ Susan Phillips. "[No Fine for Range Resources in Major Drilling Case, DEP Quietly Settles.](#)" *State Impact NPR*. August 30, 2017.

⁸⁹ Reid Frazier. "[\\$3 Million Settlement Revealed in High-Profile Fracking Case.](#)" *Alabama Public Radio*. June 4, 2019.

⁹⁰ Associated Press. "[Ohio Well Fire Will Result in \\$223,000 Fine Against Statoil.](#)" *Akron Beacon Journal*. September 16, 2015.

⁹¹ Erin Brodwin. "[Parts of Oklahoma Now Have the Same Earthquake Risk as California – and a New Study Found a Scarily Direct Link to Fracking.](#)" *Business Insider*. February 2, 2018.

⁹² Richard A. Oppel, Jr. "[Oklahoma Court Rules Homeowners Can Sue Oil Companies Over Quakes.](#)" *New York Times*. June 30, 2015.

⁹³ KFor-TV, K. Query. "[Oklahoma Court Dismisses Lawsuit Against Three Energy Companies.](#)" *Kfor.com*. April 5, 2017.

monetary damages.⁹⁴ In addition, California's Attorney General announced a civil lawsuit against the company seeking an injunction, civil penalties, and restitution.⁹⁵ The Los Angeles County also filed four criminal misdemeanor charges against SoCalGas for failing to immediately notify state authorities when the leak was detected.⁹⁶ The leak triggered a number of regulatory initiatives such as bills introduced by California state senators to impose a moratorium on further natural gas injection or protection from Aliso Canyon wells and new inspections and safety standards regarding underground gas storage fields statewide.⁹⁷ In February 2017, SoCalGas came to an agreement with the South Coast Air Quality Monitoring District in which the company paid \$8.5 million to settle its lawsuits and make amends to the affected communities.⁹⁸

Further, in July 2014, the Government Accountability Office ("GAO") issued a report finding that the EPA's state regulatory programs regarding hydraulic fracturing do not adequately address the risks of underground injection. The GAO concluded with recommendations that the EPA update and strengthen its rules while increasing its level of enforcement, which at the time was largely delegated to state governments. This report, and the EPA's agreement with its findings, indicate that companies practicing hydraulic fracturing may experience increased legal risks going forward.⁹⁹

More recently, the West Virginia Supreme Court unanimously upheld the property rights of landowners, ruling that natural gas company EQT can't trespass on a person's land without permission to tap into gas reserves from neighboring tracts. However, a week later, the same court upheld a lower court ruling that threw out a collection of lawsuits from a different group of landowners against Antero alleging that dust, traffic, and noise from gas operations were creating a nuisance for nearby landowners. A lawyer representing residents who lost their nuisance action in the Supreme Court stated that the mixed message shows that "this is new litigation and the theories are evolving."¹⁰⁰

Reputational Risk

A number of relatively high-profile documentary films have focused on the hazardous impact of hydraulic fracturing. For example, [Gasland](#), the winner of the 2010 Sundance Film Festival Special Jury Prize, highlighted many problems allegedly associated with fracking including: chronic illness, large pools of toxic waste, explosions, and tainted water supplies. The film includes illustrative scenes of water contamination, such as an instance of flammable tap water. A sequel, [Gasland Part II](#), premiered at the 2013 Tribeca Film Festival and depicts the escalation of issues on both sides of the fracking debate. Another documentary, [Split Estate](#) examines problems that have occurred in the Western United States as the result of increased fracking operations.

⁹⁴ Abby Sewell. "[Class-Action Lawsuit Filed Over Porter Ranch Gas Leak](#)." *Los Angeles Times*. December 2, 2015.

⁹⁵ Michael Martinez. "[Porter Ranch Gas Leak: Legal Woes Mount for SoCalGas](#)." *CNN*. February 2, 2016.

⁹⁶ Paige St. John, Alice Walton. "[L.A. County Files Criminal Charges Over Porter Ranch Gas Leak](#)." *Los Angeles Times*. February 2, 2016.

⁹⁷ Sharon McNary. "[Porter Ranch Gas Leak: A Look at the New California State Bills Lawmakers Have Proposed](#)." *KPCC*. January 11, 2016.

⁹⁸ Tony Barboza. "[Southern California Gas to Pay \\$8.5 Million to Settle Lawsuit over Aliso Canyon Leak](#)." *Los Angeles Times*. February 8, 2017.

⁹⁹ Michael Muskal. "[Congressional Watchdog Urges EPA to Step Up Actions on Fracking](#)." *Los Angeles Times*. July 28, 2014.

¹⁰⁰ Ken Ward Jr. / The Charleston Gazette-Mail. "[In West Virginia, Fracking Companies Lost on Trespassing, but a Court Just Gave Them a Different Win](#)." *State Impact Pennsylvania*. June 14, 2019.

The public is gradually becoming aware of the potential risks associated with fracking and opposition to it on environmental grounds is building. As fracking operations have moved closer to urban areas, awareness of, and opposition to, fracking has grown significantly.¹⁰¹

There are now hundreds of community-based anti-fracking groups that have emerged worldwide, receiving help from environmental groups to assist in their grassroots activism.¹⁰² For example, in response to the EPA granting an Underground Injection Control permit to Seneca Resources Corporation, a subsidiary of National Fuel Gas Company, a few concerned community members filed a petition for review of the permit; Seneca's license was upheld by the EPA appellate board.¹⁰³ Furthermore, Seneca Resources' proposal to the U.S. Forest Service to engage in fracking in the Sespe Wilderness met with opposition by some local residents who led a petition effort called [SavetheSespe](#). Even former Secretary of State and then-CEO of Exxon Mobil Corp., Rex Tillerson, publicly opposed a potential fracking-related construction project in his neighborhood. In late 2013, Tillerson and other neighbors filed suit to block the construction of a water tower near his property in Bartonville, Texas. Part of the suit alleged that the water tower, if completed, would cause "a noise nuisance and traffic hazards" because it would provide water for use in hydraulic fracturing. Mr. Tillerson's lawyer stated that the suit is a personal suit not related to Exxon, and that his client's problem with the water tower relates to his property value, not its potential use in hydraulic fracturing.¹⁰⁴ However, the fact that the suit specifically mentions fracking concerns may raise reputational risks for an industry-leading company currently involved in hydraulic fracturing.¹⁰⁵

Corporate environmental performance could also be highly correlated with reputational risks as companies that perform poorly from an environmental perspective could face various risks to all aspects of their operations. For example, Cabot Oil & Gas received numerous violations from the PADEP and has been involved in lawsuits regarding contaminated water supplies. In 2009, the PADEP [fined](#) Cabot Oil & Gas \$56,650 after accidents caused three spills in Susquehanna County in one week and the company was ordered to cease all fracking operations in that area until it submitted an updated fracking plan and an engineering study. The following year, the PADEP [fined](#) Cabot \$240,000, suspended all of its new drilling permits, and ordered the firm to plug three wells within 40 days that were suspected to be the source of gas seepage into groundwater in Dimock Township, Susquehanna County. Further, Cabot established a \$4.1 million fund for the 19 families with polluted water wells in Dimock, PA per the settlement of a separate lawsuit.¹⁰⁶

Additionally, New York State's attorney general sent subpoenas to Cabot Oil and Gas, Range Resources, and Goodrich Petroleum in August 2011 to investigate whether the firms improperly reported the potential performance of wells and true costs of drilling.¹⁰⁷ Chevron Corporation has faced its own share of controversy. In February 2014, a natural gas well exploded in Bobtown, Pennsylvania, resulting in a multi-day fire. In response, Chevron apologized to the community and distributed vouchers for pizza and soda at a local pizza restaurant.¹⁰⁸ The

¹⁰¹ Dan Voorhis. "[As Oil, Gas 'Fracking' Gains Popularity in Kansas, So Does Safety Debate.](#)" *The Wichita Eagle*. March 3, 2012.

¹⁰² Christopher Helman, Energy Source. "[An Investigation Of The Global Anti-Fracking Movement.](#)" *Forbes*. January 2, 2013.

¹⁰³ Jessica Corso. "[Seneca Accuses Pa. Town of Unlawfully Blocking Waste Well.](#)" *Law 360*. February 19, 2015.

¹⁰⁴ Daniel Gilbert. "[Exxon CEO Joins Suit Citing Fracking Concerns.](#)" *The Wall Street Journal*. February 20, 2014.

¹⁰⁵ Shortly after the suit became public knowledge, the former executive vice president of Mobil oil [prior to its merger with Exxon] wrote an open letter to Mr. Tillerson commenting on the perceived hypocrisy of his suit. The former executive, Louis W. Allstadt, is a well-known, and vocal, opponent of fracking (Lindsay Abrams. "[Former Oil Exec Calls Exxon CEO Out On His Hypocritical Anti-Fracking Lawsuit.](#)" *Salon*. February 28, 2014).

¹⁰⁶ Jim Snyder. "[Tainted-Well Lawsuits Mount Against Gas Frackers Led By Cabot.](#)" *Bloomberg*. January 30, 2012.

¹⁰⁷ Ian Urbina. "[New York Subpoenas Energy Firms.](#)" *New York Times*. August 18, 2011.

¹⁰⁸ Lindsay Abrams. "[Chevron Apologizes for Fracking Well Explosion with Coupons for Free Pizza.](#)" *Salon*. February 18, 2014.

controversy gained national attention as Stephen Colbert mocked the company's apology on Comedy Central's *The Colbert Report*, while a petition demanding that Chevron apologize for the insult garnered over 13,000 signatures.¹⁰⁹ Chevron was later issued nine citations by the PADEP as a result of the incident.¹¹⁰

Fugitive Methane Emissions

While natural gas has been touted as a more environmentally-friendly alternative energy solution, the rapid expansion of the natural gas industry has sparked significant concerns over greenhouse gas emissions associated with fracking operations, particularly fugitive methane gas emissions that escape at different points along the natural gas supply chain. Specifically, methane can be emitted from the wellhead during flow-back return of fluids, during drill-out following fracturing, and during well venting. In addition, methane can be emitted during equipment leaks, transport, distribution, processing, and liquid unloading.¹¹¹

Methane is a potent greenhouse gas that traps significantly more heat than carbon dioxide ("CO₂"). According to the EPA, [methane](#) is between 28 and 36 times more potent than CO₂ over a 100-year period and 84-87 times stronger over a 20-year period with respect to its contribution to global warming. Further, the EPA [concluded](#) that natural gas systems were the second largest anthropogenic source of methane emissions in the U.S. in 2015 (behind enteric fermentation, i.e. cattle), pumping over 162 million metric tons of CO₂ equivalent into the atmosphere. Though there is a great degree of uncertainty as to the precise amount of methane emitted each year because of fracking operations, the role of methane as a contributor to climate change is undisputed.¹¹²

However, it may be that the quantity of emissions from shale gas production are "strikingly lower" than previous estimates. A 2012 MIT [study](#) found that the amount of methane emissions caused by shale gas production may have been largely exaggerated. According to the lead author of the study, "[w]hile increased efforts need to be made to reduce emissions from the gas industry overall, the production of shale gas has not significantly increased total emissions from the sector."¹¹³ Conversely, a 2013 [study](#) published in the *Proceedings of the National Academy of Sciences* suggests that atmospheric levels of methane are much higher than projected, again calling into question the accuracy of EPA estimates.¹¹⁴

Nevertheless, measuring methane leakage remains difficult. In a 2016 study by Carnegie Mellon researchers, emissions from five out of 17 unconventional natural gas sites were found to be significantly underestimated by the Pennsylvania natural gas emissions inventory. These five sites yielded emissions data ranging from 10-40 times greater than facility-level methane emissions data from the PADEP.¹¹⁵ Further, a study published in February 2017 provided new insight into the extent of methane leakage throughout the entire fracking cycle. The researchers performed a comprehensive review of over 30,000 wells over a ten-year period from 2005 to

¹⁰⁹ Katie Colaneri. "[Chevron Pizza 'Scandal' Leaves Small Town Divided.](#)" *NPR*. March 25, 2014.

¹¹⁰ Sean D. Hamill. "[DEP Issues Chevron Nine Citations in Fatal Gas Well Blast.](#)" *Pittsburgh Post-Gazette*. April 10, 2014.

¹¹¹ James Conca. "[Fugitive Methane Caught in the Act of Raising GHG.](#)" *Forbes*. July 15, 2012.

¹¹² While methane is more potent and traps more heat than CO₂, it does not last as long in the atmosphere. Methane lingers in the atmosphere for approximately 10 years and CO₂ can persist for a century or more. This means that reducing fugitive methane gas now correlates to less methane gas warming the Earth in the near future (Andrew C. Revkin, Clifford Krauss. "[Curbing Emissions by Sealing Gas Leaks.](#)" *New York Times*. October 14, 2009).

¹¹³ Vicki Ekstrom. "[Study: 'Fugitive' Methane from Shale Gas Production Less Than Previously Thought.](#)" MIT Energy Initiative. November 29, 2012.

¹¹⁴ Andrew C. Revkin. "[New Study Finds U.S. Has Greatly Underestimated Methane Emissions.](#)" *New York Times*. November 25, 2013.

¹¹⁵ Mark Omara, et al. "[Methane Emissions from Conventional and Unconventional Natural Gas Production Sites in the Marcellus Shale Basin.](#)" *American Chemical Society*. Environmental Science and Technology, Vol. 50, pp. 2099-2107. January 29, 2016.

2014. The researchers identified over 6,600 spills across Colorado, New Mexico, North Dakota, and Pennsylvania. This data contrasts starkly with the 457 spills recorded by the EPA for eight states between 2006 and 2012 because the agency did not account for downstream spills from transportation and storage of the fuels. In fact, the researchers found that storage and transportation account for roughly half of the total methane emissions over the full cycle of unconventionally-extracted fossil fuels. Further complicating the issue, each state has its own spill reporting standards; some allow smaller spills to go unreported, and data for many other spills may originate solely from word of mouth.¹¹⁶

According to the Environmental Defense Fund, which plans to launch its own monitoring satellite in 2022, emissions from the oil and gas sector could actually be 60% higher than estimates by the EPA. In December 2019, as the first time that methane from an oil or gas incident has been both detected and quantified via satellite during a routine global survey, a 2018 leak at a natural gas well in Ohio was found to have leaked more methane in the 20 days it took to stop the leak than all but three European nations emit over an entire year. Scientists gauge that the leak released 60 kilotons of methane into the atmosphere, five times the amount estimated by ExxonMobil, whose subsidiary XTO Energy owned the well. Previously, the largest accidental release of methane in the U.S. was attributed to the 2015 Aliso Canyon incident in California which lasted four months.¹¹⁷

Measurement inconsistencies are also prevalent on the global scale, where many countries do not report their emissions data. Countries of concern include Iraq, Angola, and Libya, all of which have never reported their methane emissions to the UN.¹¹⁸ For one of the most potent greenhouse gases, the absence of a global, comprehensive system of measuring and reporting methane emissions remains a major concern for regulators and environmentalists alike. As the picture becomes clearer, firms with global reach may find themselves at the center of new research into the extent of their methane emissions profile.

Major regulations to curb the release of methane from fracking operations include the [New Source Performance Standards](#) (“NSPS”) which were introduced in 2012 and made effective on December 31, 2014. In April 2012, the EPA released [rules](#) that would limit methane emissions from existing natural gas wells. The EPA stated that its intent in setting standards for hydraulically fractured gas wells was to “require reduced emissions completions,” more commonly known as “green completions,” by using special equipment to prevent fugitive emissions. In January 2015, the EPA [announced](#) that it would begin the process of developing rules to directly address and reduce pollution from methane and other volatile organic compounds (“VOCs”) in the oil and natural gas industry. The EPA released the [proposed measures](#) in April 2015 and finalized the rules in May 2016.¹¹⁹ The overarching goal is to cut methane emissions from the oil and gas sector by 40-45% over the next decade from 2012 levels. However, the new rules would apply only to new or modified sites. Regulations involve requiring companies to install technology that prevents inadvertent methane leakages and monitoring their operations for possible leaks.¹²⁰ The agency would also extend [requirements](#) for addressing emissions of VOCs to existing oil and gas sources in ozone nonattainment areas and states in the Ozone Transport Region by issuing Control Techniques Guidelines (“CTGs”) that provide an analysis of the available technologies for controlling VOC emissions from

¹¹⁶ Duke University. [“6,600 Spills from Fracking in Just Four States.”](#) *ScienceDaily*. February 21, 2017.

¹¹⁷ Steven Mufson. [“A Blowout Turned an Ohio Natural Gas Well into a Methane ‘Super-Emitter.’”](#) *The Washington Post*. December 16, 2019.

¹¹⁸ [“Methane Leaks: A Dirty Little Secret.”](#) *The Economist*. July 23, 2016.

¹¹⁹ Amy Harder, Erin Ailworth. [“EPA Issues Final Rules Cutting Oil, Natural Gas Methane Emissions.”](#) *The Wall Street Journal*. May 12, 2016.

¹²⁰ Amy Harder. [“EPA Set to Regulate Oil and Gas Methane Emissions.”](#) *The Wall Street Journal*. January 14, 2015.

existing sources. States would have some discretion in applying CTGs to individual sources. Reducing VOC emissions will also reduce methane emissions as a co-benefit.

On March 1, 2018, the EPA [announced amendments](#) to two narrow provisions of the NSPS, and stated that it is "...reconsidering certain aspects of the NSPS and intends to look broadly at the rule during that time." On September 11, 2018, the EPA proposed additional [amendments](#) to the NSPS which, among other changes, would cut the frequency of required leak inspections on drilling equipment and double the amount of time that a company could wait before repairing a methane leak. One of the other critical amendments proposed by the EPA in its September announcement was to allow energy companies to follow state-level methane standards in states with their own standards instead of federal standards.¹²¹ In response to the easing of federal regulations, states themselves are tightening standards in many instances, such as in California where utilities are being required to prioritize repairs on lines which contribute to greenhouse gas emissions in an approach which seeks to reduce utility methane leaks 40% by 2030.¹²² In August 2019, the EPA [proposed](#) amendments to the 2012 and 2016 NSPS. To remove "unnecessary regulatory duplication," the EPA has proposed two primary actions. First, it proposed the exemption of sources in the transmission and storage segment of the oil and gas industry to regulation. Second, it proposed the rescission of methane emission limits from the production and processing segments of the industry, while keeping emissions limits for volatile organic compounds ("VOCs"); the EPA argues that the controls to reduce VOCs also reduce methane, making methane limitations redundant.¹²³

The EPA's [Natural Gas STAR](#) program presents a number of cost effective technologies and practices for companies in the industry to reduce and recapture emissions. In July 2015, the EPA [proposed](#) a voluntary Natural Gas STAR Methane Challenge Program for stakeholder feedback, which expands on the Natural Gas STAR program. According to the EPA, Methane Challenge Program partners transparently report systematic and comprehensive actions to reduce methane emissions and are publicly recognized as leaders in reducing methane emissions in the U.S. Doing so reduces operational risk, increases efficiency, and demonstrates company concern for the environment, with benefits spanning from climate change to air quality improvements to conservation of a non-renewable energy resource. Other agencies have also proposed new regulations regarding methane emissions. In November 2016, the Interior Department finalized regulation aimed at reducing methane emissions from oil and gas drilling on public land by targeting venting and flaring. However, a 2017 House vote overturned these regulations from the previous administration.¹²⁴

Furthermore, the Department of Transportation's Pipeline and Hazardous Materials Safety Administration ("PHMSA") [finalized](#) natural gas pipeline safety standards, which aim to reduce methane emissions by promoting greater safety. Other rulemakings, including "[Expanding the Use of Excess Flow Valves in Applications Other Than Single-Family Residences in Gas Distribution Systems](#)" are also expected to reduce methane emissions.

There may be significant incentives for companies to find ways to mitigate fugitive methane emissions. According to a March 2014 [study](#) released by the Environmental Defense Fund, companies may see annual savings of at least \$150 million if they reduce methane emissions 40% below current 2018 projections. The study also found that the costs of many reduction measures will pay for themselves over time when implementing the new EPA rules and using lower-emitting valves and improved leak detection systems at production sites.¹²⁵ The

¹²¹ Coral Davenport. "[Trump Administration Wants to Make It Easier to Release Methane into Air.](#)" *New York Times*. September 10, 2018.

¹²² Robert Walton. "[California Requires Utilities to Address Pipeline Methane Leaks.](#)" *Utility Dive*. October 15, 2018.

¹²³ Umar Ali. "[EPA Proposes Rollbacks to US Methane Regulations.](#)" *Offshore Technology*. August 30, 2019.

¹²⁴ Hal Bernton. "[House Votes to Overturn Obama's Rule on Methane Emissions.](#)" *The Seattle Times*. February 3, 2017.

¹²⁵ Jim Efstathiou Jr. "[Drillers Can Plug Methane Leaks at Wells Cheaply: Study.](#)" *Bloomberg*. March 2, 2014.

aforementioned November 2012 MIT [study](#) of fugitive methane emissions found that companies are currently capturing approximately 70% of potential fugitive emissions, and it is in their best economic interests to try to capture the remaining 30%. “When companies vent and flare methane they are losing gas that they could have captured and sold,” stated one of the study’s authors. “When we compared the cost of installing the right equipment to capture this gas to the loss in revenue if it isn’t captured, we found the majority of shale wells make money by capturing the potential ‘fugitive’ emissions.”

Further, in an effort to ensure that companies are mitigating both losses to profits as well as environmental harm, there has been a rise in the development of new technologies that may decrease potential methane losses, such as the use of smart automated plunger lifts during liquid unloading, the use of flash-tank separators or vapor recovery units, better storage tanks and compressors, and better leak detectors.¹²⁶

As this is a rapidly evolving issue with both environmental and financial implications, companies that operate in the natural gas industry should carefully consider risks associated with their methane emissions. Although it appears that companies may face reduced regulatory requirements and risk, they may face potentially significant reputational risks as the natural gas industry may come under scrutiny over its role in the emission of greenhouse gases amidst a rollback of regulation.

Flaring

Flaring is the burning of natural gas emissions which leak or vent from wells during a company’s fracking operations. As previously mentioned, a majority of fugitive methane emissions are captured, but emissions that are not captured are vented or flared. Generally, flaring and venting are easier and less costly to companies than undergoing “green completions,” which ensure that excess natural gas is captured rather than being released into the atmosphere. Some see flaring as the better alternative to venting; because methane gas is more potent than CO₂, venting methane gas in its full state poses a greater environmental risk than releasing the CO₂ that results from flaring.¹²⁷ Regardless of the rationale, flaring as a policy presents a full suite of financial, regulatory, legal, and social risks for companies.

A March 2014 hearing before the House Subcommittee on Energy and Power featured several testimonies about the benefits of and challenges to energy access. [Testimony](#) from Andrew Logan of Ceres, an environmental advocacy group, highlighted the risks associated with flaring. According to Mr. Logan, flaring is a growing problem in the U.S. as it is environmentally destructive, economically wasteful, and largely avoidable. In North Dakota, the country’s second-largest oil-producing state, 36% of fracked gas was flared in December 2013. Previously, in 2012, the emissions from flared gas in North Dakota “were equivalent to adding over one million cars to the road.” Flaring also accounted for \$1 billion in lost revenue in the state. Significant flaring [reductions](#) took place in North Dakota after 2013, and March 2016 saw a decrease to only 10% of North Dakota’s natural gas flared. However, 2018 saw record highs, with the state flaring 527 million cubic feet of gas per day, enough to heat 4.25 million average U.S. homes - or enough to meet the natural gas needs for all of North and South Dakota, including industrial and commercial demands.¹²⁸ Meanwhile, in Texas, the country’s leading oil-producing state, issuance of flaring permits rose ten-fold since 2010. Additionally, Mr. Logan stated that flaring-related issues “will only be solved when the regulatory structure changes so that flaring is no longer the easiest option.” However, it does not appear that a regulatory

¹²⁶ James Conca. “[Fugitive Methane Caught in the Act of Raising GHG.](#)” *Forbes*. July 15, 2012.

¹²⁷ Timothy Gardner, Ayesha Rascoe. “[Fracking Rules Let Drillers Flare Till 2015.](#)” *Reuters*. April 18, 2012.

¹²⁸ Amy Dalrymple. “[North Dakota Natural Gas Flaring Hits Record High; Improvement Expected in 2019.](#)” *Grand Forks Herald*. December 25, 2018.

solution will solve this issue in the near future; in February 2017, the House of Representatives voted to repeal the Obama Administration's flaring regulations, although the Senate did not pass the repeal.^{129, 130}

There are a number of groups attempting to limit the amount of flaring resulting from drilling operations. For example, in 2014, an oil industry task force representing companies in North Dakota made an "all-out effort" to ensure that all flared natural gas in the Bakken shale oil field is captured by the end of the decade. The group estimates that the current 70% recapture standard can be increased to 90% in six years. The task force also proposed stricter regulations, drilling permits, tax credits, and low interest loans to incentivize cooperation with these efforts.¹³¹

It is unsurprising that companies are paying close attention to issues related to flaring; a lack of attention to proper storage and containment of natural gas can have significant financial implications. For example, in North Dakota, mostly as a result of an insufficient number of pipelines and processing plants, an estimated \$1 million in gas per day is being emitted and drillers are flaring approximately 27% of the gas they produce. Moreover, as a result, some of the people owning the rights have filed class-action lawsuits claiming that when this gas is wasted, they are losing money. The plaintiffs in this case are essentially requesting that royalty owners be paid their royalties on the gas that has been flared.¹³² As of November 2018, the state had opted to keep its existing capture goal of 88%, but it was choosing to focus more on increasing the volume of captured gas rather than lowering the volume of gas being flared.¹³³ North Dakota senators voted against a bill in February 2019 which, originally aimed at reducing flaring through taxes and royalties, had been revised to be a legislative management study to analyze flare rates and how other states were addressing the issue.¹³⁴

Conclusion

Hydraulic fracturing is a rapidly evolving issue that is likely to continue changing in the coming years. Over the last several years, shareholders have been increasingly vocal regarding this issue, placing a variety of shareholder proposals at companies that host fracking operations. In addition, this topic has received significant attention from state, federal, and international lawmakers, leading to both current and proposed legislation intended to mitigate the potential negative effects of fracking and to provide the public with improved access to information regarding the impacts associated with fracking.

As the potential environmental, health-related, regulatory, and reputational risks from fracking operations become fully realized, we expect to see this dynamic issue to continue to evolve. As such, we believe that investors should be cognizant of the aforementioned risks in order to ensure that companies are providing appropriate disclosure and oversight of fracking operations and mitigating these risks to the greatest extent possible.

¹²⁹ The Associated Press. "[House Votes to Overturn Obama Rule on Natural Gas 'Flaring'.](#)" *The Denver Post*. February 3, 2017.

¹³⁰ Valerie Volcovici. "[Bid to Revoke Obama Methane Rule Fails in Surprise U.S. Senate Vote.](#)" *Reuters*. May 10, 2017.

¹³¹ Clifford Krauss. "[Industry in North Dakota to Cut Flared Natural Gas.](#)" *New York Times*. January 29, 2014.

¹³² Jeff Brady. "[Much of North Dakota's Natural Gas is Going Up in Flames.](#)" *NPR*. January 30, 2014.

¹³³ Renée Jean. "[North Dakota Relaxes Flaring Rules.](#)" *Williston Herald*. November 23, 2018.

¹³⁴ Amy Dalrymple. "[North Dakota Senate Defeats Bill to Study Natural Gas Flaring.](#)" *Grand Forks Herald*. February 13, 2019.

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