



Too Big to Shale

By [Milo McBride](#)

How the Federal Reserve's fracking bailout could yield economic and climate catastrophe

When global energy demand screeched to a halt in the pandemic-ridden spring of 2020, it exposed the dire reality of American shale production. The industry of “fracking,” as it is commonly called, has brought both the US economy and global climate to increasingly precarious positions.

The oil and gas sector constitutes around 8% of the US GDP,¹ with nearly three quarters of its production from fracked, shale formations.² However, since the industry’s rise in 2010, more than \$300 billion has been lost.³ While the fracking boom allowed the US to regain energy independence from other oil producing nations, it has come with incalculable domestic and planetary costs. America’s shale revolution is the latest and perhaps most damaging fossil fuel boom and bust to date. It’s a saga of financial hubris, paradoxical economics, and the antiquated pursuit of global petroleum dominance in a world transitioning to renewable energy technologies.

The Fed rescues American oil

While fracking was initially welcomed by eager investors,⁴ Wall Street has abandoned US oil and gas firms in recent years due to longstanding negative cashflow and stagnant production growth.^{5 6} However, in the aftermath of the coronavirus’ shock to energy markets, shale producers have found a surprising ally: the US Federal Reserve. Central banks are designed to function independently from the federal government, autonomous of political discourse and prohibited from prioritizing individual sectors.⁷ And yet, the Fed has gone where most investors dare not tread by acting as a “lender of last resort” to a practically insolvent fracking industry.

¹ American Petroleum Institute. “Oil & Natural Gas Contribution to U.S. Economy Fact Sheet.”

² U.S. Energy Information Administration (EIA). “Frequently Asked Questions (FAQs) .”

³ Deloitte, “Implications of COVID-19 for the US Shale Industry.”

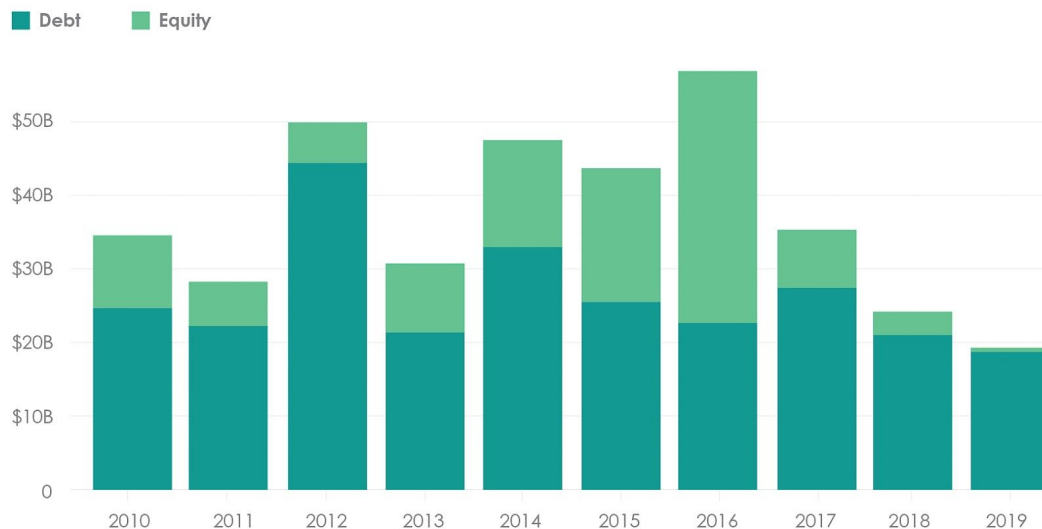
⁴ Touryalai, “Guess Who’s Fueling the Fracking Boom?” Forbes.

⁵ Hiller, “U.S. Shale’s Growth Rate Peaked Last Year, Slower Gains Ahead.” Reuters.

⁶ Meyer and Rennison, “Investors Starve US Shale Drillers of Capital.” Financial Times.

⁷ IMFBlog, “Central Bank Accountability, Independence, and Transparency.”

Investors abandon US oil & gas producers



Source: Dealogic @FT
2019 encompasses issuance to mid-October

Investors relinquish US fossil fuel companies

The unusual turn of events began in March when the central bank announced its \$2 trillion Main Street Lending Program as part of its broader COVID-19 relief package. At a time of widespread fossil fuel lobbying,⁸ the Independent Petroleum Association of America (IPAA) wrote a letter to the US Federal Reserve imploring them to amend their policy, ensuring that the monetary stimulus could now be used for debt refinancing⁹ – something that shale producers urgently needed.¹⁰

The following week, a group of eleven Senate Republicans from oil producing states echoed these demands. The congressional representatives specifically asked that the Fed move back the date by which a firm's credit rating would be evaluated and, accordingly, deemed entitled to the program's benefits.^{11 12}

⁸ Carrington, "Polluter Bailouts and Lobbying during Covid-19 Pandemic." The Guardian.

⁹ French and Price, "U.S. Energy Industry Steps up Lobbying for Fed's Emergency Aid." Reuters.

¹⁰ Holland, "Moody's: Oil, gas drillers face daunting debt wall in next 4 years." S&P Global.

¹¹ Colman and Guida, "Fed's Expansion of Lending Program Sparks Oil Bailout Worries." Politico.

¹² Grandoni, "The Energy 202: Oil Companies Have a New Lobbying Target during Pandemic — the Federal Reserve." The Washington Post.

Also at this time, Secretary of Energy Dan Brouillette and Secretary Treasury Steve Mnuchin worked closely with the Federal Reserve to expand the reach of the Main Street Lending Program to ensure that it would apply to mid-sized firms in addition to smaller ones.¹³ Brouillette, who was recently appointed by the president, told *Bloomberg TV* that he was acting at the direction of the executive branch.¹⁴

By late April, the Fed issued alterations,¹⁵ many in accordance with the demands of the oil and gas industry and its political advocates. The lending initiative was now eligible to mid-sized firms, the date was moved back and the loan could be used to pay off debt.¹⁶

As reported by *Politico*, the US Federal Reserve has denied any allegations of prioritizing oil and gas, let alone any specific sector, in its actions.¹⁷ The Fed has also denied a request from the environmental litigation group Food & Water Watch to release communications with government officials and industry advocates on the topic.¹⁸

Leading up to this drastic shift in monetary policy, the fracking industry proved particularly feeble in the wake of the pandemic. In contrast with adjacent economic sectors like communication services or utilities, US energy companies experienced record drops in bond ratings during the shutdown and subsequent collapse of international oil prices.¹⁹ Shale producers were already vulnerable to downgraded credit ratings as they were long dependent on the riskiest form of corporate investment: junk debt.²⁰

¹³ Vankat, "U.S.'s Mnuchin Considers Lending Program for Struggling Oil Companies." Reuters.

¹⁴ Moshin and Natter, "Energy Chief Says Fed Asked to Expand Lending for Oil Firms." Bloomberg.

¹⁵ The Federal Reserve "Federal Reserve Board Announces It Is Expanding the Scope and Eligibility for the Main Street Lending Program."

¹⁶ Geiger, "Federal Reserve Extends Lifeline To Ailing U.S. Oil Industry." Oil Price.

¹⁷ Colman and Guida, "Fed's Expansion of Lending Program Sparks Oil Bailout Worries." Politico.

¹⁸ Food and Water Watch, "Federal Reserve Fails to Disclose Information about Oil and Gas Industry Bailouts."

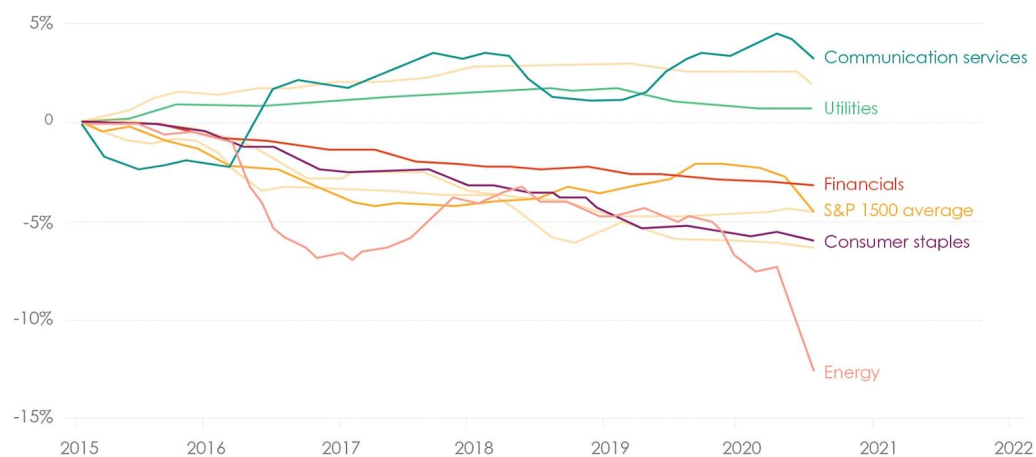
¹⁹ InfluenceMap, "Necessary Intervention or Excessive Risk?"

²⁰ Mutua, "Shale Bond Buyers Get Picky as More Producers Default." Bloomberg.

The rise of shale junk bonds

According to InfluenceMap, a non-partisan UK based think tank, a third of US oil and gas firms are considered “junk” status or non-investment grade.²¹ Frackers have accrued insurmountable amounts of junk debt and, amidst plummeting energy demand and prices, many struggled to meet their financial obligations.²² As a result, some have already declared bankruptcy²³ like in the case of fracking heavyweight Chesapeake Energy Corporation.^{24 25}

Change in bond ratings in sectors in the S&P 1500
Change in the 3-month running average of issuer ratings since 2015 (%)



Source: Financial Disclosures; ©InfluenceMap

Energy sector credit ratings collapse following the pandemic

Typically, “junk bonds” (or “high yield bonds,” depending on whom you ask), offer investors higher risk but with the prospect of higher returns than traditional corporate grade debt. Also known as speculative-grade debt, they come with a lower credit

²¹ InfluenceMap, “Necessary Intervention or Excessive Risk?”

²² Rennison and Ablan, “US Energy ‘Junk’ Bonds Hammered by Oil Plunge.” Financial Times.

²³ Tabuchi, “Fracking Firms Fail, Rewarding Executives and Raising Climate Fears.” The New York Times.

²⁴ French and Spector, “Chesapeake Energy to file for bankruptcy as soon as this week-sources” Reuters.

²⁵ Eddings and Keller, “Chesapeake Investors Seen Signaling Surrender as Bonds Plunge.” Bloomberg.

rating than investment grade corporate bonds. The energy sector today holds around 12% of the US market for high yield bonds, more than any other industry in the nation.²⁶

Junk bonds were popularized in the 1980s by Michael Milken and the investment firm Drexel Burnham Lambert²⁷ and have always been controversial. Critics have charged Milken and Drexel with facilitating leveraged buy-outs that led to the dismantling of many American corporations. These acquisitions drastically increased the amount of debt a company incurred, often leading to dramatic cost cutting measures. Some argue that such buy-outs resulted in job losses, plant closings and the hollowing out of key industries – particularly in the manufacturing sector.²⁸ According to John Morris, a retired managing director at Wells Fargo, junk bonds are “the pawnshop of financial markets.”²⁹

Others, however, say high-yield debt was instrumental in opening investment to industries that previously did not have access. By the 1990's, junk bonds had become a legitimized source of funding for blossoming service sectors like Las Vegas casinos^{30 31} and Silicon Valley tech firms (although precipitating its upheaval in the “dot com crash” of 2002).³²

Shale producers thrived on junk debt in the aftermath of the 2008 crisis. The wake of financial consolidation presented a fertile environment for frackers to flourish: The recapitalized banks were keen to lend to the industry, catalyzing fracking's fast-paced, but expensive growth. Accordingly, the Fed's newly instated 0% interest rates made it easier to raise junk debt.^{33 34}

²⁶ Rennison, “Oil Price War Spells Danger for US Junk Bonds.” *Financial Times*

²⁷ Abelson et al., “Renegades of Junk: The Rise and Fall of the Drexel Empire.” *Bloomberg Business*.

²⁸ Curtis, *The Mayfair Set, Episode 3 - Destroy the Technostructure*. BBC.

²⁹ Morris, *High Yield Bonds & Financial Markets*.

³⁰ Labich, “Steve Wynn: A 2.5 Billion Wager.” *Fortune Magazine*.

³¹ *The Independent*, “Trump Returns with New Junk Bond Offer.”

³² Jark, “The History of High-Yield Bond Meltdowns.” *Investopedia*.

³³ McLean, “Opinion | The Next Financial Crisis Lurks Underground.” *The New York Times*.

³⁴ Sammon, “How the Bank Bailout Hobbled the Climate Fight.” *The New Republic*.

In the years to follow, the price of oil would float to record highs around \$100 a barrel, encouraging investment in what appeared to be a revolution in America's energy sector.³⁵

One of several early fracking firms to receive investment at this time was EOG Resources,³⁶ considered the US's largest shale specific oil & gas producer today (Exxon and Chevron produce more when off-shore and conventional drilling is included).³⁷ EOG, the abbreviation of Enron Oil & Gas, splintered from its parent company in 1999, shortly before Enron's bankruptcy and conviction of fraud.³⁸

Since 2008, the rush of corporate bond investment caused the amount of junk debt in independent oil & gas firms to triple—amassing to nearly \$800 billion by the end of 2013, according to *The Houston Chronicle*.³⁹ During these same years, junk bond-fueled US oil production increased by more than a half. To many, this was nothing short of a miracle as it marked America's first consistent growth in oil production since the 1970's.^{40 41}

As this boom accelerated, the first cracks in the shale narrative appeared. Energy analysts began to point out that fracking is significantly more capital intensive than drilling a conventional well.^{42 43 44} Shale rock formations are located more than a mile beneath the earth's surface, while conventional drilling has historically taken place at higher depths.⁴⁵ Furthermore, fracturing shale requires sophisticated, deep-reaching directional (or "slant") drills that are expensive⁴⁶ and demand precision⁴⁷ as inaccurate fractures can lead to "hundreds of thousands of dollars of lost production value per well," according to Texas based Motive Drilling Technologies.⁴⁸

³⁵ Macrotrends, "Crude Oil Prices - 70 Year Historical Chart."

³⁶ Crooks, "The US Shale Revolution." Financial Times

³⁷ DiLallo, "These Are the Biggest Oil Producers in the United States." The Motley Fool.

³⁸ De Rouffignac, "Enron Oil & Gas Finalizes Separation with Enron through Stock Deal." Houston Business Journal.

³⁹ Eaton, "Shale's Junk Debt Could Get Shaky If Fed Raises Rates." The Houston Chronicle.

⁴⁰ U.S. Energy Information Administration (EIA), "EIA-914 Monthly Production Report."

⁴¹ Macrotrends, "U.S. Crude Oil Production - Historical Chart."

⁴² Dimick, "How Long Can the U.S. Oil Boom Last?" The National Geographic.

⁴³ Oil Price, "How Shale Oil Will Change the World."

⁴⁴ Baillie, "Factbox: Key Facts and Potential Challenges of Tight Oil." Reuters.

⁴⁵ Joyce and Wirfs-Brock, "The Rising Cost Of Cleaning Up After Oil And Gas." Inside Energy.

⁴⁶ U.S. Energy Information Administration (EIA), "Hydraulically Fractured Horizontal Wells Account for Most New Oil and Natural Gas Wells."

⁴⁷ Wang, Wen, and Chen, "Horizontal Directional Drilling-Length Detection Technology While Drilling Based on Bi-Electro-Magnetic Sensing."

⁴⁸ Motive Drilling Technologie, "Directional Drilling Challenges."

Additionally, the supply chains of fracking are vast and costly. Early reports estimate that between 2,300 and 4,000 truck trips are required to frack one well, more than twice that of conventional oil rigs.⁴⁹ Oil field servicing firms like Halliburton or Schlumberger provide everything from drilling equipment to the chemical cocktails required for slickwater injection which pushes the oil or gas from the shale sediment.

While these high costs were justified by the notion that fracking would produce a higher yield,⁵⁰ the flow from these wells can be unusually short lived.⁵¹ A 2013 Harvard study issued claims that the maximum extractive potential of a fracking rig is only in the “early months of activity” and will produce significantly less crude than a conventional well for the remaining decades of its life. The report goes on to explain that “oil companies intensively drill for new wells that offset the loss of production from older wells.”⁵²

It soon became apparent that the logistics of shale extraction were undercutting hopes for a positive cashflow. According to Kathy Hipple, a financial analyst at the Institute for Energy Economics and Financial Analysis, shale companies “did not have a proven business model and, to this date, they do not have a proven business model.”⁵³

Similar concerns were echoed by Alexander Medvedev, Deputy Chief Executive of Gazprom, Russia's largest gas company which had acquired fracking technology in a 2011 deal with Exxon XTO.⁵⁴ Medvedev told The Wall Street Journal “our traditional reserves are tenfold more efficient than shale resources” and that Russia would revisit the technology at a later point in the 21st century.⁵⁵

The treadmill effect

The combination of high capital costs and low production yields creates a Kafka-esque cycle of drilling, extracting, under-producing, debt-refinancing, and then fracturing more wells to repeat on a larger scale. To those in the industry, this process is known as

⁴⁹ Cassidy, “Here They Come Again! The Impacts of Oil and Gas Truck Traffic.” FracTracker Alliance.

⁵⁰ U.S. Energy Information Administration (EIA), “Hydraulically Fractured Horizontal Wells Account for Most New Oil and Natural Gas Wells.”

⁵¹ Loder, “U.S. Shale-Oil Boom May Not Last as Fracking Wells Lack Staying Power.” Bloomberg.

⁵² Maugeri, “The U.S. Shale Oil Boom: A U.S. Phenomenon.” Harvard Kennedy School, The Belfer Center for Science & International Affairs.

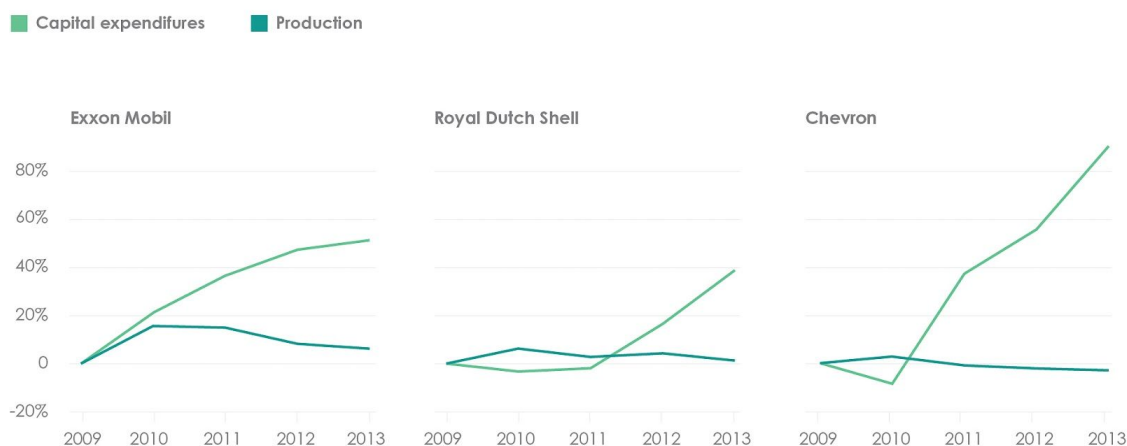
⁵³ Hipple, Economic & Financial Discussion of Shale Extraction.

⁵⁴ Humpert, “ExxonMobil Gains Access to Arctic Oil and Gas Reserves in Deal with Rosneft.” The Arctic Institute.

⁵⁵ DeZemmer, “Gazprom Sits Out Shale Race.” The Wall Street Journal.

“treadmilling” or the “red queen”—a reference to a scene in *Alice In Wonderland* in which Alice runs vigorously from the Red Queen, only to be stuck in the same place.

Change in production and capital expenditures since 2009



Source: the companies; The Wall Street Journal

By 2010, oil majors had adopted fracking technology^{56 57}

Despite growing skepticism around the economics of fracking, the Fed's alumni continued to be one of the industry's most consistent promoters. At a 2014 conference in Houston, former Fed chairman Ben Bernanke cited shale as “one of the most beneficial, if not the most beneficial developments in the last few years. I mean, it's just a terrific achievement.”⁵⁸

However, the exponential growth perpetuated by the treadmill effect came with further consequences to the industry's livelihood. Alongside shifts in geopolitics and OPEC+ policies, the rapid expansion of US shale production created an oversupply that triggered the historic oil price collapse of 2014.⁵⁹ While the year began with oil prices floating around \$100 a barrel, they had plummeted below \$60 by December—a price range far beneath what fracking had initially been built on.

⁵⁶ Driver and Reddal, “Big Oil Companies Face Growing Concern on Fracking.” Reuters.

⁵⁷ King, “Big Oil May Improve Fracking.” Politico.

⁵⁸ Hackbarth, “Ben Bernanke Is Bullish About Shale Energy.” US Chamber of Commerce.

⁵⁹ Baffes et al, “What Triggered the Oil Price Plunge of 2014-2016 and Why It Failed to Deliver an Economic Impetus in Eight Charts.” World Bank.

Although oil markets were shaken by such volatility, many US officials saw the shale boom's promise of oil independence as a foreign policy dream come true.⁶⁰ Former Fed Chairman and corporate director at Mobil Corporation (later ExxonMobil)⁶¹ Alan Greenspan, declared victory in a 2015 op-ed in the Financial Times entitled "OPEC has ceded its power to the US over oil price." Thanks to fracking, Greenspan dubbed the US the winner in the race for global petroleum dominance against the cartel of oil producing nations.⁶²

But at this time of collapsing oil prices, Joe Barton, a Republican congressman from Texas, noticed that leading fracking firms like CoconoPhillips and Pioneer Resources were under distress from over-production and lack of refineries for processing. Instead of dialing back such unstable growth, Barton successfully petitioned the Obama White House to end the 40-year ban on oil exports.⁶³

With lifting the oil export embargo, the US would surpass Saudi Arabia and Russia in becoming the world's largest producer and exporter of fossil fuels.^{64 65} Opening US shale to international markets also ensured demand⁶⁶ for cash strapped producers and prevented the fracking treadmill of debt from collapsing into a credit crisis.

⁶⁰ Council on Foreign Relations, "Timeline: Oil Dependence & Foreign Policy."

⁶¹ Nash and Times, "Senate, by 91 to 2, Backs Greenspan as Fed Chief." The New York Times.

⁶² Greenspan, "Opec Has Ceded to the US Its Power over Oil Price." Financial Times.

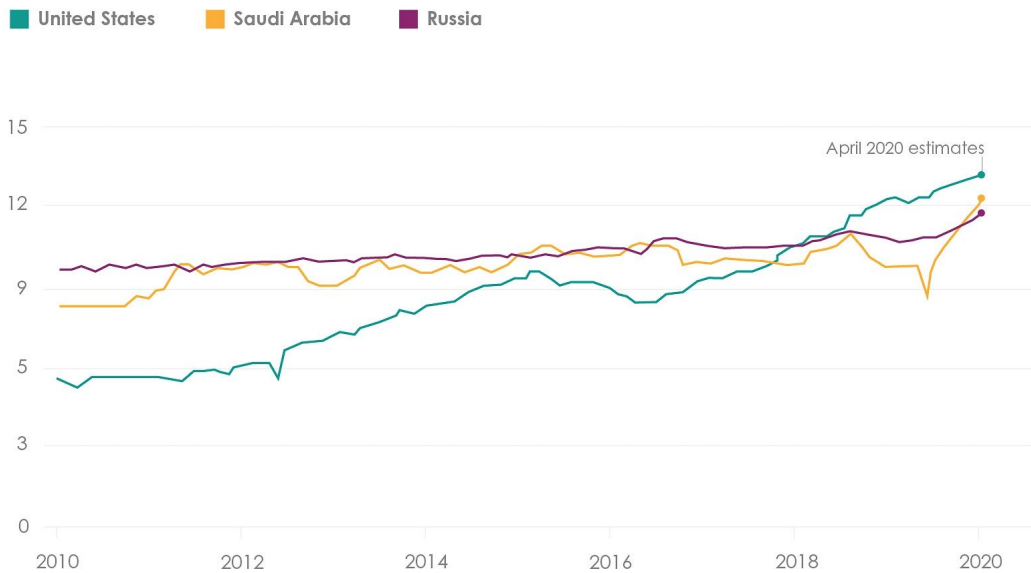
⁶³ Barton, "I knew my bill to lift the ban on U.S. oil exports was important. I hardly expected it to change the world." Dallas News.

⁶⁴ U.S. Energy Information Administration (EIA), "The U.S. Leads Global Petroleum and Natural Gas Production with Record Growth in 2018."

⁶⁵ Rystad Energy, "North America Becomes Self-Sufficient in Oil."

⁶⁶ Egan, "After 40-Year Ban, U.S. Starts Exporting Crude Oil." CNN.

US surpasses Russia and Saudi Arabia Crude oil production, m barrels per day



Source: Bloomberg; EIA; The Economist

US oil production exceeds Russia and Saudi Arabia

Facing the economic reality of shale

Despite praise from its former Chairmen, even the Fed itself raised concerns over the industry's ballooning debt and negative cashflow in a [2016 report](#). It detailed that break-even prices in different shale producing regions fluctuated between \$23-60.⁶⁷ The day the report was published, oil prices rested at around \$41.⁶⁸ By the Fed's own numbers, much of US shale oil was unprofitable.

The central bank's report also echoed unsettling data from the US Energy Information Agency (EIA): approximately 80% of revenue produced from onshore drilling was being allocated to debt refinancing. In an ominous conclusion, the Fed warned that "financial markets may also be a mechanism that transmits oil market deterioration to

⁶⁷ Macrotrends, "Crude Oil Prices - 70 Year Historical Chart."

⁶⁸ Board of Governors of the Federal Reserve System et al., "Unraveling the Oil Conundrum."

the broader economy.”⁶⁹ The statement foreshadowed the central bank’s motives for the bailout in spring of 2020.

Regardless of the growing demand from newly opened international markets, fracking firms were presented with further obstacles. While shale rich regions like the Permian Basin became more densely drilled, decreasing distance between wells was found to depressurize the rush of oil.⁷⁰ Known as “child” wells, this lackluster extraction is believed to decrease yield by 15-20% and, as of 2017, effected more than half of all production in the Permian.⁷¹

As fracking expanded, critical resources used to fracture wells like sand⁷² and water⁷³ became increasingly sought after, adding further to the industry’s already burdensome expenses. The combination of lower marginal returns and higher marginal costs began to impact the balance sheets of shale producers. Even big oil monoliths like Exxon and Chevron were not delivering the profits they had promised.⁷⁴ To combat these concerns, Exxon reassured investors that returns would materialize by selling them on a slew of new business strategies.⁷⁵ The firm even forged a brand alliance with Microsoft’s Azure cloud computing system that sought to create more accurate, effective fracking.⁷⁶

⁶⁹ Board of Governors of the Federal Reserve System et al., “Unraveling the Oil Conundrum.”

⁷⁰ Olson, “Shale Companies, Adding Ever More Wells, Threaten Future of U.S. Oil Boom.” The Wall Street Journal

⁷¹ Adams-Heard and Crowley, “Permian ‘Child’ Wells May Cut Oil Recovery up to 20%, Bank Says.” Bloomberg.

⁷² Blum, “Has Fracking Reached Peak Sand?” The Houston Chronicle.

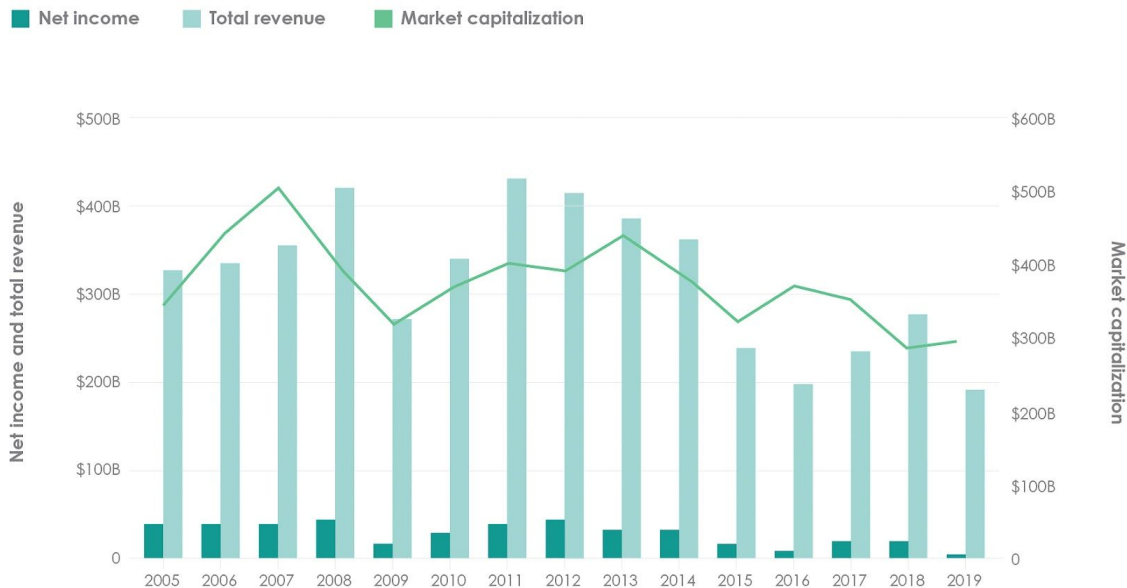
⁷³ Gabbatiss, “Scientists Warn Fracking Could Cause Water Shortages after Usage Shoots up by 800% in Parts of US.” The Independent.

⁷⁴ Hiller “Exxon, Chevron Earnings Fall on Lower Oil and Gas Prices.” Reuters.

⁷⁵ Schneyder, “Exxon Tries to Sell Wall Street on Growth Plan, but Shares Drop.” Reuters.

⁷⁶ Microsoft, “XTO Energy Taps into IoT and the Cloud to Optimize Operations and Drive Growth with Azure and Dynamics 365.”

Exxon Mobil Corp.'s annual financial metrics (US\$B)



Source: S&P Global Market Intelligence
2019 data is through third quarter; market capitalization as of last business day of respective period

Exxon struggles to deliver positive cashflow

By 2019, the questionable financials of shale only worsened. The growth and returns that investors were continuously assured never came to be and the expansion of well productivity began to stagnate⁷⁷ despite advancements in drilling technology and data analytics. After a decade of financing high-risk fracking projects, Wall Street had sealed its gates to the shale industry.^{78 79}

On the ground, the situation became dire. In May of 2019, West Texas gas had experienced negative prices due to oversupply and lack of adequate infrastructure for transport.⁸⁰ By October, fracking trucks stood idle and stripped for precious parts⁸¹—the treadmill had run itself to the ground.

⁷⁷ Elliott, "Shale Boom Is Slowing Just When the World Needs Oil Most." The Wall Street Journal.

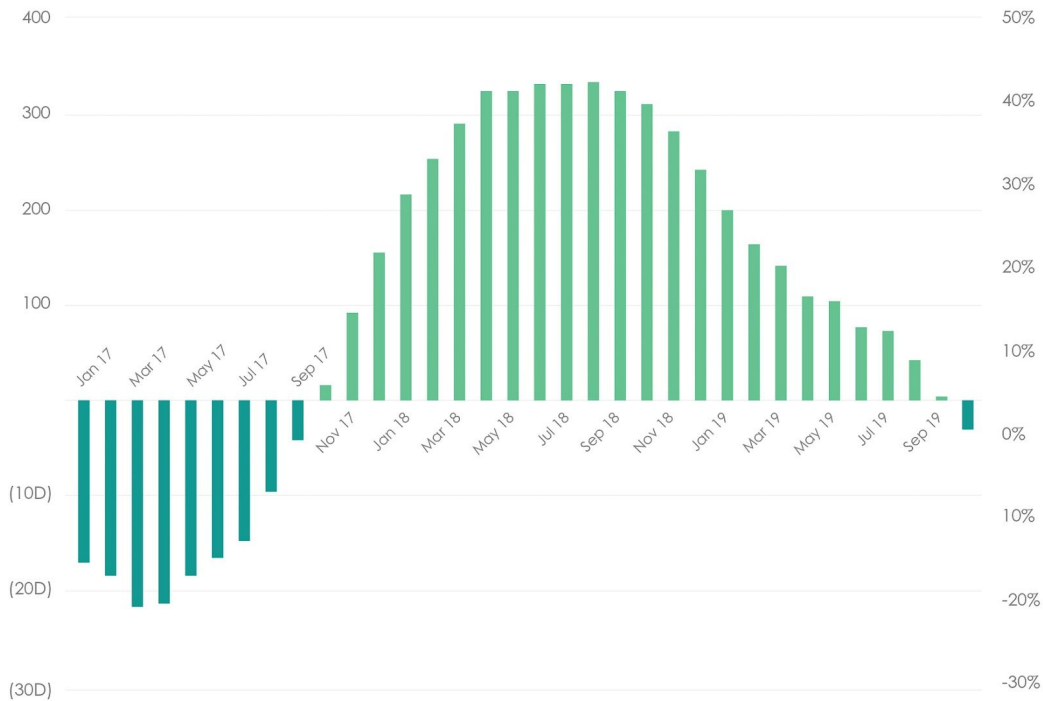
⁷⁸ Elliott, "Frackers Scrounge for Cash as Wall Street Closes Doors." The Wall Street Journal.

⁷⁹ Adams-Heard and Crowley, "Cracks Show in Permian's Promise as Shale Producers Retrench." Bloomberg.

⁸⁰ DiSavino, "U.S. Natural Gas Prices Turn Negative in Texas Permian Shale Again." Reuters.

⁸¹ Wethe, "Idled Frac Fleets Sold for Scrap amid Shale Drilling Slump." Bloomberg.

Shale oil productivity per well productivity change Y-o-Y



Source: EIA; HFI Research @Seeking Alpha

Fracking production growth spirals into decline

But the calamitous state of the fracking industry did not hamper the Fed's vocal support. In November of 2019, Chairman of the Federal Reserve Jerome Powell addressed the US Senate. At the hearing, he was pressed on his opinion of progressive taxation, as it was then being discussed in the Democratic presidential primaries. Powell recused himself from what he rightfully deemed a politicized discussion.

Yet, when Texas Senator Ted Cruz (R-TX) questioned the chairman on what he thought of Bernanke's praise of the shale boom, Powell did not hesitate to respond that it "had been a great thing for this country" and that efforts to dismantle the fracking industry "would probably not be good for the economy."⁸²

⁸² Guida, "As Warren, Sanders Urge Fracking Ban, Fed Chief Warns of Consequences." Politico.

While the Fed does not have the ability to change policy, the words of its Chair and board are carefully observed by both elected officials⁸³ and financial markets.⁸⁴ Perhaps even more important was what the chairman did not say. Left unspoken was any mention of the highly competitive alternative to fossil fuels—renewable energy. Powell did not acknowledge that goals to dismantle the fracking industry go in tandem with bringing the US to 100% clean energy by 2035.^{85 86} A report from UC Berkeley has illustrated that these targets are not only within technological reach, but come with no additional costs for consumers.⁸⁷ Other estimates conclude that these goals would produce 25 million new jobs.⁸⁸

Renewables: a way out

Clean energy employs around 3 million Americans today, roughly three times the size of those working in fossil fuels.^{89 90} For the past decade, renewable energy labor markets have grown steadily and, by 2016, the US solar workforce alone surpassed the size of all areas of fossil fuel extraction.⁹¹ Even in Texas, the top shale producing state,^{92 93} the fastest growing job is a wind turbine technician.⁹⁴

⁸³ Siegel, "Powell Warns Recession 'Has Not Fallen Equally on All Americans,' Public Health Crisis Will Dictate Recovery." The Washington Post.

⁸⁴ Racanelli, "When the Fed Chair Speaks, the Market Moves. Data Proves It." Barrons.

⁸⁵ Kolbert, "Tackling Climate Change? Governor Jay Inslee Has a Plan for That." Yale e360.

⁸⁶ Chow, "How Biden's Climate Plan Makes Clean Energy by 2035 'Very Doable.'" MSNBC.

⁸⁷ Abhyankar et al, "2035 Report | Renewable Energy Costs & Our Clean Electricity Future." UC Berkeley, Goldman School of Public Policy.

⁸⁸ Calisch and Griffith, "Jobs Report." Rewiring America.

⁸⁹ US Department of Energy, "2017 U.S. Energy and Employment Report."

⁹⁰ E2, "Clean Jobs America 2019 - Nearly 3.3 Million Clean Energy Jobs."

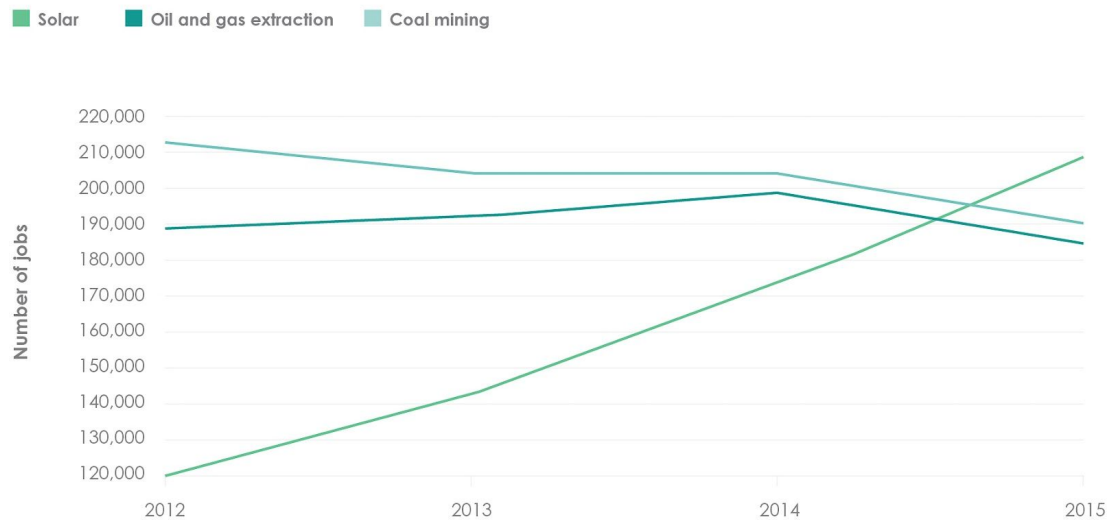
⁹¹ McCarthy, "Solar Employs More People In U.S. Electricity Generation Than Oil, Coal And Gas Combined." Forbes.

⁹² Chen, "Top 6 Oil-Producing States." Investopedia.

⁹³ Garside, "U.S. Crude Oil Production by State 2019." Statista.

⁹⁴ Bradshaw, "Report: These are the 10 Fastest Growing Jobs in Texas." The Houston Chronicle.

There are more jobs in solar than oil and gas



Source: Bloomberg; International Renewable Energy Agency; U.S. Bureau of Statistics

US solar PV labor market surpasses those in fossil fuel upstream

Furthermore, the quality of employment that fracking has delivered is unsustainable in both the short and long term. Although built on an initial goldrush,⁹⁵ industry claims of economic development in shale rich regions never came to fruition. Unpayable rents, rising foreclosures, stressed education systems,⁹⁶ and the proliferation of so-called “man camps”—isolated labor compounds riddled with drugs and sex-trafficking—strained local communities and workers. Many of those laboring on fracking rigs work 12-hour shifts for weeks on end amidst grueling heat and hazardous conditions.⁹⁷

Renewables are not only safer for their workers, but also a safer bet for investors. Solar photovoltaic and wind energy have proven more resilient to market volatility than their fossil counterparts. In the months following the pandemic, a report from Climate Nexus' Bailout Watch indicated that 11% of fossil fuel firms required the US Treasury's Paycheck Protection Program while only 3% of renewable firms took the stimulus.⁹⁸

⁹⁵ Dews, “The Economic Benefits of Fracking.” The Brookings Institute.

⁹⁶ Wallace, “The Permian Basin Is Booming With Oil. But at What Cost to West Texans?” Texas Monthly.

⁹⁷ Blum, “The Evolution of ‘man Camps’ — from Tents to Basketball Courts and Swimming Pools.” The Houston Chronicle.

⁹⁸ Climate Nexus, “Fossil Fuel Companies Needed More Bailouts than Renewable Energy Firms.”

While much of the attention has been focused on the fracking boom, quietly, American renewable generation has nearly doubled in the past decade.⁹⁹ Since 2015, wind and solar have both been cheaper than gas,¹⁰⁰ causing US energy markets to respond accordingly. The EIA's 2020 forecasts indicate that two thirds of the year's newly installed energy generation will be in renewables, with only a third in fossil gas.¹⁰¹

America's gamble for energy independence by underwriting shale producers¹⁰² has also come at the expense of the country developing a leading renewable energy industry of its own. Although solar photovoltaics were pioneered in Bell and NASA labs,^{103 104} the US has fallen severely behind in the race for renewable production, let alone the possibility of export. The top four solar manufacturers today are all Chinese with the US's Sun Power coming in tenth place behind Canadian and South Korean firms.^{105 106}

The future is only getting more bleak for US oil and gas producers. Today, they lag in their transition to renewables^{107 108} while nearly a third of their assets are now considered at risk of being stranded.¹⁰⁹ Meanwhile, Nordic fossil fuel firms like Equinor and Ørsted have aggressively swooped into US renewable markets, now dominating offshore wind contracts across the American northeast.¹¹⁰

Despite claims of dominance in international petroleum markets, the US never stood a chance in taming state-owned oil giants who can ride out periodic price shocks. When the pandemic slashed global energy demand, Russia began a price war with Saudi Arabia by refusing to cut its oil production. Consequently, the price of oil collapsed to record lows, shattering an already weakened US shale industry.¹¹¹

⁹⁹ U.S. Energy Information Administration (EIA), "U.S. Renewable Electricity Generation Has Doubled since 2008."

¹⁰⁰ Lazard, "Levelized Cost of Energy 2017."

¹⁰¹ U.S. Energy Information Administration (EIA), "New Electric Generating Capacity in 2020 Will Come Primarily from Wind and Solar."

¹⁰² Makhijani, "Cashing in on All of the Above." The Price of Oil.

¹⁰³ NASA, "Advanced Energy: Photovoltaics."

¹⁰⁴ US Department of Energy, "History of Solar Energy."

¹⁰⁵ Solar News, "10 Top Solar Panel Companies & Manufacturers for 2019 | Energy Sage."

¹⁰⁶ Bloch, "Top 10 Solar Panel Manufacturers In 2019 (Shipments)." Solar Quotes.

¹⁰⁷ Mahajan, "If U.S. Emissions Rose In 2018 Despite Clean Energy Growth, How Can We Meet Climate Goals?" Forbes.

¹⁰⁸ Reed, "Europe's Big Oil Companies Are Turning Electric." The New York Times.

¹⁰⁹ Livsey, "Lex in Depth." Financial Times.

¹¹⁰ Gheorghiu, "New York Awards Record 1,700 MW Offshore Wind Contracts." Utility Drive.

¹¹¹ Foy and Brower, "Can Russia Use Saudi Price War to Strike a Fatal Blow on US Shale?" Financial Times.

Such fragility was conceded in Republican senator Kevin Cramer's letter to the Fed that pleaded with the central bank to evaluate the credit ratings of domestic energy firms prior to the "market manipulations from the Saudi Arabia and Russia oil dispute."¹¹² In this respect, Alan Greenspan's 2015 declaration that OPEC+ had surrendered control of oil prices looks exceptionally far-fetched: There is no beating the oil cartel at their own game.

By and large, the US has wasted decades by investing in fracking over renewable technologies. Even the oil and gas industry itself recognizes the age of fossil fuels is coming to an end. Both US^{113 114} and Saudi¹¹⁵ producers have accepted the possibility that oil demand will, or has already, peaked.

Fracking and climate catastrophe

Above all, the US's disastrous bet on fracking has caused irreparable damage to the climate. Fracked gas was once sold to Americans as a more sustainable alternative to coal¹¹⁶ by some mainstream environmental groups,¹¹⁷ the Obama administration¹¹⁸ and superstar investors like Warren Buffet^{119 120} and Michael Bloomberg.^{121 122}

However, since 2011, Dr. Richard Howarth and a team of Cornell scientists have explicitly warned that shale gas releases exceptional amounts of methane, a greenhouse gas considered 80 times more potent to warming than carbon dioxide. In his forthcoming paper for the Union of the Atomic Scientists, Dr. Howarth writes that fossil gas is a "disastrous fuel, one with a greenhouse gas footprint that exceeds that of coal when viewed over the time period of the next few decades."¹²³

¹¹² US Senator Kevin Cramer, "Colleagues Urge Administration & Fed to Make Credit Facilities Accessible to Domestic Energy Producers."

¹¹³ Brower, "Shale Boss Says US Has Passed Peak Oil." Financial Times.

¹¹⁴ Crowley et al, "Peak Shale: How US Output Went From Explosive to Sluggish." Bloomberg.

¹¹⁵ Shankleman and Smith, "Why Even Saudi Aramco Is Now Talking About 'Peak Oil.'" Bloomberg.

¹¹⁶ Gardiner, "Is Natural Gas Good, or Just Less Bad?" The New York Times.

¹¹⁷ Applebome, "Drilling Critics Face a Divide Over the Goal of Their Fight." The New York Times.

¹¹⁸ Helman, "President Obama Gets It: Fracking Is Awesome." Forbes.

¹¹⁹ Mullaney, "Warren Buffett on Climate Change: Friend or Foe?." CNBC

¹²⁰ Chiglinky et al, "Warren Buffett Bets \$9.7 Billion on a Long Future for Natural Gas." Bloomberg.

¹²¹ "Bloomberg Criticizes New York Fracking Ban." The Wall Street Journal.

¹²² Fang, "Bloomberg's Investment Portfolio Includes Bets on Private Equity, Fracking." The Intercept.

¹²³ Robert W. Howarth, Ph.D., "No Room for Natural Gas in a Climate-Smart Future." The Bulletin of the Atomic Scientists.

In the life cycle of shale gas production, methane is flared and vented during extraction,¹²⁴ leaked during transportation and endlessly spewed from old wells that remain unplugged.^{125 126} According to a Reuters's special report, the US is currently home to over 3 million abandoned wells, around 2 million of which have not been plugged correctly and are a likely contributor to a recent surge in methane emissions.¹²⁷ Due to their depth, plugging shale wells is both labor and capital intensive with estimates ranging between 2,500–100,000 USD per well.¹²⁸

Despite decades of warning from NASA¹²⁹ and the Pentagon,¹³⁰ the Fed is only now waking up to the inevitable impacts of climate chaos. At a conference in January of 2020, Powell affirmed the central bank's role in preparing the economy for a changing climate¹³¹ but noted that such threats were not short-term.¹³²

These tepid assurances came shortly after Kevin Stiroh, the vice president of the New York Federal Reserve, said in a speech that the “US economy has experienced more than \$500 billion in direct losses over the last five years due to climate and weather-related events.” In addition, the vice president said that climate change has “significant consequences for the US economy and financial sector.”¹³³

Regardless of Stiroh and Powell's statements, the Fed has yet to follow the EU Central Bank's lead by incorporating the macroeconomic implications of the climate crisis into its reports, let alone policy making.¹³⁴

In the midst of shale's bailout, scientists estimate that methane emissions are at an all-time high. Approximately 80% of the US's recent increase in methane emissions can

¹²⁴ McKenna, “Super-Polluting Methane Emissions Twice Federal Estimates in Permian Basin, Study Finds.” Inside Climate News.

¹²⁵ Lee, “Millions of abandoned wells spark climate, safety fears.” E&E News.

¹²⁶ Marchese and Zimmerle, “The US Natural Gas Industry Is Leaking Way More Methane than Previously Thought.” The Conversation.

¹²⁷ Groom, “Special Report: Millions of abandoned oil wells are leaking methane, a climate menace.” Reuters.

¹²⁸ Frazier, “DEP, CNX Reach \$1.48 M Settlement on Abandoned Wells.” NPR: State Impact Pennsylvania.

¹²⁹ Milman, “Ex-Nasa Scientist: 30 years on, the world is failing miserably to address climate change.” The Guardian.

¹³⁰ US Department of Defense, “Security Implications of Climate Change.”

¹³¹ Saphir, “Fed Has a Role in Combating Climate Change Risk, Powell Says.” Reuters.

¹³² Davies, “Central Banks Begin to Grapple with Climate Change.” Financial Times.

¹³³ Federal Reserve Bank of New York, “Emerging Issues for Risk Managers.”

¹³⁴ Davies, “Central Banks Begin to Grapple with Climate Change.” Financial Times.

be linked to fossil fuels¹³⁵ and accordingly, the fracking boom (as coal combustion, the other fossil producer of methane, has plummeted by nearly a half since 2010).¹³⁶

The widespread acceptance of methane's destructive potential comes at a time when scientists say that planetary warming is accelerating faster than previous predictions. A 2020 UN report estimates that rising emissions over the next five years could ensure a 1.5 C rise in warming¹³⁷—an irreversibly damaging threshold for human and ecological life alike.¹³⁸

The Federal Reserve needs a new direction

The Fed's bailout of the fracking industry not only poses threats to the nation's environmental and economic future, but it may also be undermining the Fed's most valuable asset: its monetary integrity and stature as the world's pre-eminent central bank. In Sebastian Mallaby's timely piece in *Foreign Affairs* "The Age of Magic Money," the economic fellow at the Council on Foreign Relations warns that as the US increases its national debt, successful management of that debt will depend on the credibility of the Federal Reserve. Mallaby goes on to conclude that "If the Fed loses its independence, the age of magic money could end in catastrophe."¹³⁹

The Federal Reserve now finds itself trapped between contradictory agendas. Despite its much-stated independence from American politics and business, the central bank has put an insolvent industry on life support. In doing so, it appears to prioritize short-term political and financial stability over the disastrous long-term feedback loops for the climate, the economy and its own reputation. By bailing out the fracking industry, it has successfully blurred the line between foreign energy strategy and domestic monetary responsibility. It may be the best example yet of the unintended consequences brought on by the Fed's unprecedented intervention in the US—and global economy.

¹³⁵ Tabuchi, "Global Methane Emissions Reach a Record High." *The New York Times*.

¹³⁶ Kuykendall, "US Coal Sector Remains in Rough Shape Heading into 2020s after Decade of Decline." *S&P Global*.

¹³⁷ Jordans and Lesage, "UN: World could hit 1.5-degree warming threshold by 2024." *Associated Press*.

¹³⁸ The Climate Reality Project, "Why Is 1.5 Degrees the Danger Line for Global Warming?"

¹³⁹ Mallaby, "The Age of Magic Money." *Foreign Affairs*.

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