ENERGY ACCOUNTABILITY SERIES 2020

GLOBAL ENERGY INSTITUTE
U.S. CHAMBER OF COMMERCE

WHAT IF...

HYDRAULIC FRACTURING WAS BANNED?

THE ECONOMIC BENEFITS OF THE SHALE REVOLUTION AND THE CONSEQUENCES OF ENDING IT

About the

ENERGY ACCOUNTABILITY SERIES 2020

This paper is the first in series of updated reports that were originally produced by the Global Energy Institute in 2016, each taking a substantive look at what might have happened in the past – or could happen in the future – if certain energy-related comments and policy prescriptions put forth by prominent politicians and their supporters were actually adopted. We call this the "Energy Accountability Series 2020."

One doesn't need to look far these days to find platforms or outlets that claim to be definitive "fact-checkers" of all manner of utterances candidates make on the campaign trail. On that, the Energy Accountability Series is not reinventing the wheel. What we're much more interested in – and what we think will be much more valuable to voters – is taking a step back to better understand (and quantify where possible) the real-world, economy-wide consequences of living in a world in which candidates' rhetoric on critical energy issues were to become reality.

Too often, there is a temptation to dismiss statements made by candidates as things said "off the cuff" or in the "heat of the moment," or perhaps offered up merely to "appeal to their base." However, candidates' views and the things they say and do to win the support of interest groups have a real impact on how policy is shaped and implemented. That is certainly true on energy issues, as groups continue to advance a "Keep It In the Ground" agenda that, if adopted, would force our country to surrender the enormous domestic benefits and global competitive advantages that affordable energy development have made possible.

The Energy Accountability Series asks the tough questions and provides clear-eyed, data-driven answers on the full impacts and implications of these policies, regardless of who is making the proposal. Our hope is that these reports help promote and inform a fact-based debate of the critical energy issues facing our country. Armed with this information, voters will have the opportunity to make the right choices for themselves and their families.

OUR MISSION

GLOBAL ENERGY INSTITUTE
U.S. CHAMBER OF COMMERCE

The mission of the U.S. Chamber of Commerce's Global Energy Institute is to unify policymakers, regulators, business leaders, and the American public behind a common sense energy strategy to help keep America secure, prosperous, and clean. Through policy development, education, and advocacy, the Institute is building support for meaningful action at the local, state, national, and international levels.

The U.S. Chamber of Commerce is the world's largest business federation representing the interests of more than 3 million businesses of all sizes, sectors, and regions, as well as state and local chambers and industry associations.

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EXECUTIVE SUMMARY

The recent growth in U.S. oil and natural gas production has been a boon to both our economy and the environment. From new jobs and higher tax revenues to lower energy costs and reduced greenhouse gas emissions, there is no question the shale energy renaissance has greatly improved America's energy outlook.

Recently, however, some candidates for elected office have pledged to ban the very technology that has enabled this boom—hydraulic fracturing (HF), or fracking. This raises an important question: what would happen to American jobs and the economy if hydraulic fracturing was banned? In this report, the Global Energy Institute has undertaken the modeling and analysis to answer that question.

Simply put, a ban on fracking in the United States would be catastrophic for our economy. Our analysis shows that if such a ban were imposed in 2021, by 2025 it would **eliminate 19 million jobs** and **reduce U.S. Gross Domestic Product (GDP) by $7.1 trillion**. Job losses in major energy producing states would be immediate and severe; in Texas alone, more than three million jobs would be lost. Tax revenue at the local, state, and federal levels would decline by nearly a combined **$1.9 trillion**, as the ban cuts off a critical source of funding for schools, first responders, infrastructure, and other critical public services.

Energy prices would also skyrocket under a fracking ban. **Natural gas prices would leap by 324 percent**, causing household energy bills to more than quadruple. By 2025, motorists would **pay twice as much at the pump for gasoline** as oil prices spike to $130 per barrel.

The report also details the impacts that a ban would have on seven states, including five that are major energy producers—Colorado, New Mexico, Ohio, Pennsylvania, and Texas. Not surprisingly, the results would devastate each of those energy states' economies. But a fracking ban's impacts would be felt well beyond energy producing regions, so the report also examines the impacts of a ban on the economies of Michigan and Wisconsin, which are large manufacturing states. There, too, the results are significant. For example, cost-of-living impacts to residential consumers in Wisconsin and Michigan would grow by approximately $4,700 and $5,100 respectively between 2021 and 2025.

Under a fracking ban, **less domestic energy production also means less energy security**, as the United States once again returns to a heavy dependence on imported oil and natural gas. This would quickly reverse America's rise as a major oil and natural gas exporter, an achievement that has reduced our trade deficit while helping our allies and trading partners enhance their energy security, reduce emissions, and ensure the energy they purchase is produced under one of the most stringent environmental regulatory regimes in the world.

Additionally, increased prices for natural gas would undermine the progress we have made in reducing greenhouse gas emissions. Since 2005, the increased use of natural gas has helped **reduce U.S. carbon dioxide emissions by more than 2.8 billion metric tons**[1] roughly the equivalent of annual emissions from Australia, Brazil, Canada, France, Germany, and the United Kingdom *combined*.

In short, America's energy revolution is delivering enormous rewards for jobs, the economy, and the environment. We must recognize these achievements and expand the benefits of U.S. shale to even more American families, while ensuring that progress achieved to date is not suddenly reversed by an ill-advised ban on hydraulic fracturing.

WHAT IF....HYDRAULIC FRACTURING WAS BANNED?

• 19 MILLION JOBS

Starting in 2021, a ban would cost the economy 4 million jobs in 2021 alone, and 19 million jobs by 2025.

• GASOLINE PRICES DOUBLE

Consumers would pay 37 percent more for petroleum products such as gasoline and diesel in 2021, with prices continuing to rise through 2025, when they would be roughly double what they are today. This is largely driven by skyrocketing oil prices that will exceed $130 per barrel in 2025.

• NATURAL GAS PRICES INCREASE 324 PERCENT

The price for U.S. natural gas – currently the largest source of power generation in the country – would surge, increasing costs for American families, businesses, and power generators. Our analysis finds that natural gas prices would be $12.30 per million British thermal unit (MMBtu) in 2025, an increase of 324 percent over the baseline or the Business As Usual (BAU) scenario.

• HOUSEHOLD POWER PRICES QUADRUPLE

U.S. households would pay over four times more for their electricity in 2025, driven in large part by rising natural gas prices.

• HIGHER OVERALL COST OF LIVING

Through 2025, consumers would pay $5,661 more per capita in higher prices for energy and other goods and services. Over the same period, nationwide household incomes would fall by $3.7 trillion, leaving consumers to pay higher bills with less income.

• NEARLY $1.9 TRILLION IN LOST TAX REVENUE

Local, state and Federal tax revenues would decline by nearly $1.9 trillion through 2025.

• $7.1 TRILLION LOSS OF GDP

GDP would immediately decline by $523 billion in 2021 relative to a world where the shale revolution is allowed to continue. This decline in GDP escalates to $2.3 trillion in lost GDP in 2025 — a loss of 11 percent of our 2018 GDP ($20.5 trillion). Through 2025, GDP would decline by $7.1 trillion.

• ENERGY AND MANUFACTURING DEVASTATED

In this report, we take a closer look at five states with large energy economies, including Ohio, Pennsylvania, Colorado, Texas, and New Mexico, and two other states with significant manufacturing sectors, Michigan and Wisconsin. Below is a snapshot that a ban on hydraulic fracturing would have on these states in 2025 due to higher prices for petroleum products, natural gas, and electricity.

• INCREASED IMPORTS AND REDUCED ENERGY SECURITY

A ban on hydraulic fracturing would be a geopolitical setback for the United States, which would return to reliance on international suppliers of oil and natural gas, including Russia and members of OPEC, giving these countries greater clout in international energy markets. Higher global prices because of reduced U.S. production would benefit our economic and geopolitical competitors and cede valuable market share to countries like Venezuela, all at a time when demand for oil and natural gas is set to grow considerably around the world, according to the International Energy Agency (IEA).[2]

Cumulative Impacts of a Hydraulic Fracturing Ban by 2025

	OH	PA	CO	TX	NM	WI	MI	U.S.
Job Impacts in 2025 (thousands)	-700	-609	-468	-3,157	-142	-300	-516	-19,404
GDP Impacts (2018 $ billions)	-245	-261	-187	-1,525	-86	-93	-159	-7,110
Household Income Impacts (2018 $ billions)	-119	-114	-120	-794	-26	-51	-88	-3,732
State & Local Tax Revenue Impacts (2018 $ billlions)	-20.6	-23.4	-14.9	-107	-8	-8	-13	-600
Federal Tax Revenue Impacts (2018 $ billlions)	-56.6	-50.3	-28	-263	-8	-16	-26	-1,270
Cost-of-Living Increase (per Capita) (2018 $)	5,625	4,654	6,490	7,280	5,790	4,777	5,170	5,661

WHAT SOME CANDIDATES AND ELECTED OFFICIALS ARE SAYING...

"Accelerate the end of fossil fuels by immediately... phasing out fracking."

Senator Cory Booker, Presidential Campaign Website

"I want you to look in my eyes. I guarantee you, I guarantee you we're gonna end fossil fuel."

Former Vice President Joe Biden, 9.6.2019, Associated Press

"On my first day as president, I will sign an executive order that puts a total moratorium on all new fossil fuel leases for drilling offshore and on public lands. And I will ban fracking — everywhere."

Senator Elizabeth Warren, 9.6.2019, Twitter

"When we are in the White House we are going to ban fracking nationwide..."

Senator Bernie Sanders, 3.19.2019, Twitter

"Yes, I support a ban on all hydraulic fracking operations."

U.S. Rep. Tulsi Gabbard, 5.31.2019, Washington Post

"There's no question I'm in favor of banning fracking.

Senator Kamala Harris, 9.4.2019, CNN

"I favor a ban on new fracking and a rapid end to existing fracking..."

Mayor Pete Buttigieg, 6.3.2019, Washington Post

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CHAPTER 1

WHAT DOES HYDRAULIC FRACTURING DELIVER TODAY?

A decade ago, the U.S. economy was reeling from the worst economic downturn in generations. Unemployment had skyrocketed to double digits, and small businesses across the country were forced to close their doors. Housing prices collapsed, and countless homes were abandoned as families owed more on their mortgages than their homes were worth.

But amidst the gloom of the Great Recession, there was a bright spot. Innovators in the U.S. oil and gas industry were unlocking tremendous amounts of new energy resources – energy that we could produce here at home rather than importing from abroad. As workers looked for employment, energy companies were offering six-figure salaries for people to help unleash America's full energy potential. From 2002 to 2012, the shale renaissance supported more than 600,000 new jobs,[1] even as the broader economy lost 2.2 million jobs.

This energy revolution took even the most informed experts by surprise. In 2008, the outlook for American energy was bleak. Domestic oil and natural gas production was slowly declining, consumer prices were high, and a future of steadily growing reliance on foreign imports seemed inevitable.

But in what seems like the blink of an eye, hydraulic fracturing, or fracking, changed everything. Today, the United States is the world's largest producer of oil and natural gas,[2,3] a result of technological breakthroughs allowing American innovators to develop hydrocarbons from shale and other tight rock formations underground. These breakthroughs have reduced energy costs for American families, lowering utility bills and prices at the pump while also helping to make a wide range of goods and services throughout the economy more affordable.

The benefits extend well beyond energy. Natural gas is an important feedstock for chemical manufacturers, and low costs in the United States meant companies began investing in new facilities in the United States rather than Europe or Asia. According to the American Chemistry Council, this has led to more than $200 billion in new chemical manufacturing investment in the United States.[4]

In fact, International Energy Agency data show that U.S. industry in 2018 paid the least amount for natural gas of any of the 27 Organization of Economic Co-operation and Development (OECD) countries for which data was reported—often as much as two to four times less.[5] Low gas prices also mean lower electricity prices, and U.S. industry also pays the lowest of any of the OECD countries for which the IEA has data. The large differential in energy prices provides a major competitive advantage for the United States, and a big reason why more and more foreign companies are investing here to take advantage of affordable energy.

Meanwhile, our new energy abundance has also transformed the United States into a major exporter, reducing trade deficits here at home and enhancing energy security of key allies abroad. In September 2019, the United States became a net exporter of crude oil and petroleum products on a monthly basis for the first time since 1949.[6] Best of all, these trends are only just beginning.

Within the next five years, the United States will become the world's largest exporter of liquefied natural gas – a stunning reversal from 15 years ago, when TIME Magazine's headline declared the United States was "running out of gas"[7] as companies scrambled to build additional import infrastructure and ensure sufficient supply to U.S. consumers.

These massive economic benefits from the shale renaissance are the direct result of American innovation. Indeed, to understand how America fundamentally changed its energy outlook requires understanding the technological advancements associated with hydraulic fracturing and other oilfield innovations that are transforming our energy and economic outlook in so many ways.

In this report, the U.S. Chamber of Commerce's Global Energy Institute has quantified what the expansion of this shale opportunity could mean for Americans all across the country and how banning hydraulic fracturing could impact the economy. This is done through modeling a scenario in which hydraulic fracturing were banned starting January 1, 2021 and running through at least the end of 2025.

The base case relies largely on the U.S. Energy Information's (EIA) 2019 Annual Energy Outlook (AEO) High Resource & Technology side case, which has done a better job of tracking market realities than EIA's Reference Case.

BACKGROUND

For decades in many parts of the country, shales and other tight formations were a mystery: known to hold enormous quantities of oil and natural gas, yet considered too expensive to develop. Innovations in the late 1990s and early 2000s transformed these tight rocks from impenetrable fortresses into some of America's largest oil and natural gas fields.

Hydraulic fracturing is a technique in which fluids under high pressure create fissures in rock formations to stimulate the flow of oil and natural gas. Fracturing technology has been used for many decades in vertical wells as a stimulation technique. Vertical wells are drilled perpendicular to the underground oil or gas formation, and fracturing increases their efficiency and output. More recently, fracturing has been used in combination with horizontal drilling in shale formations, and together they have been responsible for the dramatic increase in U.S. oil and gas production. These technologies and methods are well understood and widely acknowledged as an environmentally safe and responsible means of energy production.

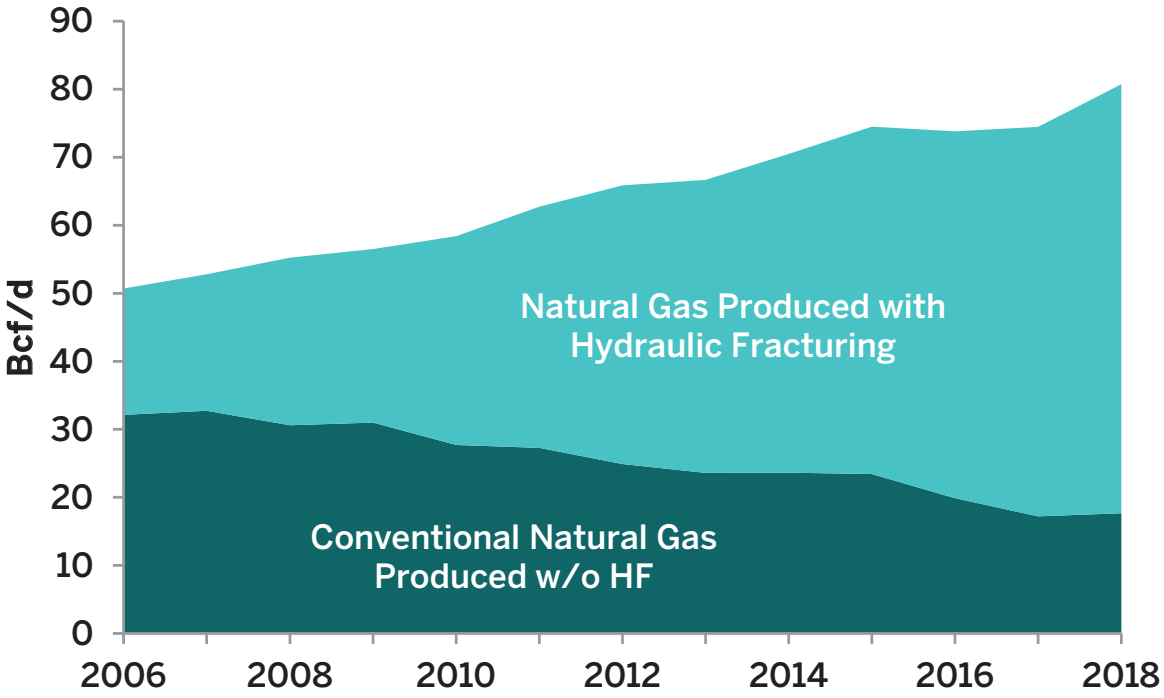
Figure 1 illustrates the importance of hydraulic fracturing as a contributor to U.S. natural gas supply. In 2006, only 37 percent of natural gas was produced via hydraulic fracturing technology. By 2018, that number grew to 78 percent of production.

Similarly, Figure 2 shows hydraulic fracturing's role in adding to crude oil production. In 2006, only six percent of U.S. crude oil was developed from wells that underwent fracture treatments. By 2018, the amount grew to more than 60 percent.

NATURAL GAS PRODUCTION AND PRICES

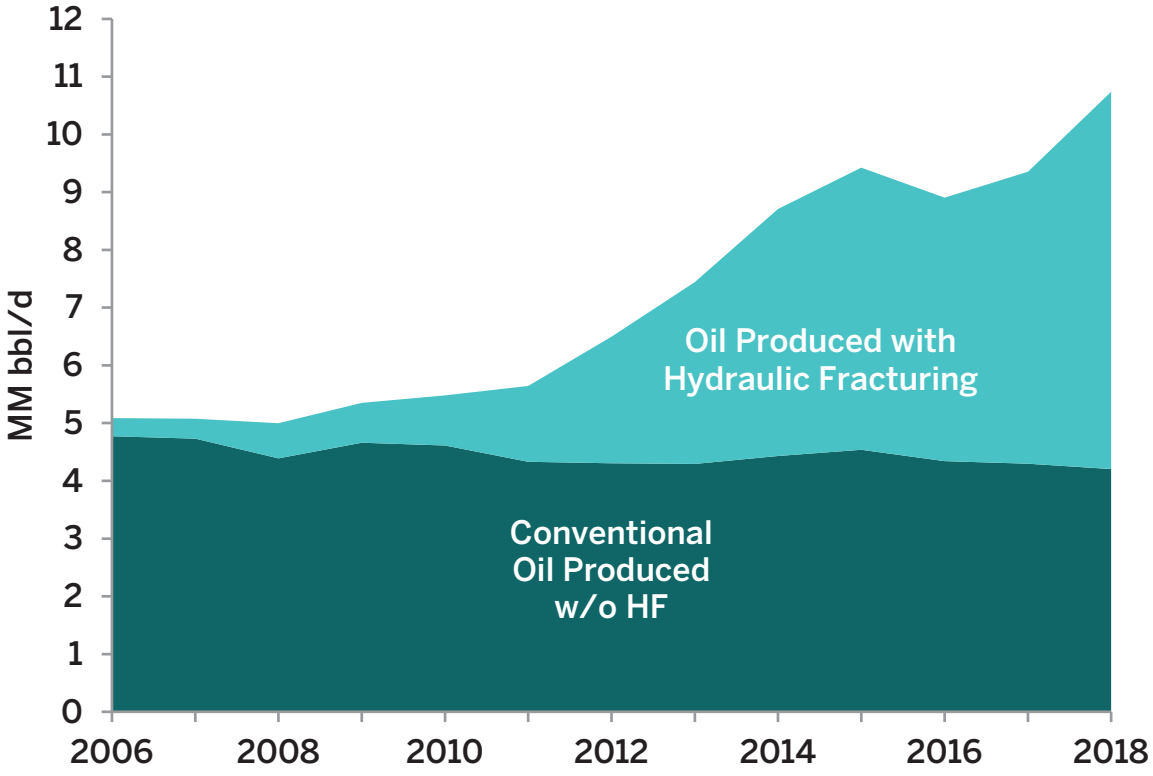
Thanks to the development of shale resources, the United States has dramatically increased its natural gas production. Figure 1 displays the sources for American natural gas today and where it is expected to come from in the future. "Natural Gas Produced with Hydraulic Fracturing" in the chart includes both shale and tight gas (shale gas is trapped between layers of shale rock formations; tight gas is in low permeability limestone or sandstone formations). While hydraulic fracturing is used as part of some coalbed methane production, for the purposes of this study, we conservatively include coalbed methane in the category of conventional natural gas production.

Figure 1: Historical Gas Production



Source: EIA Annual Energy Outlook 2019

Figure 2: Historical Oil Production



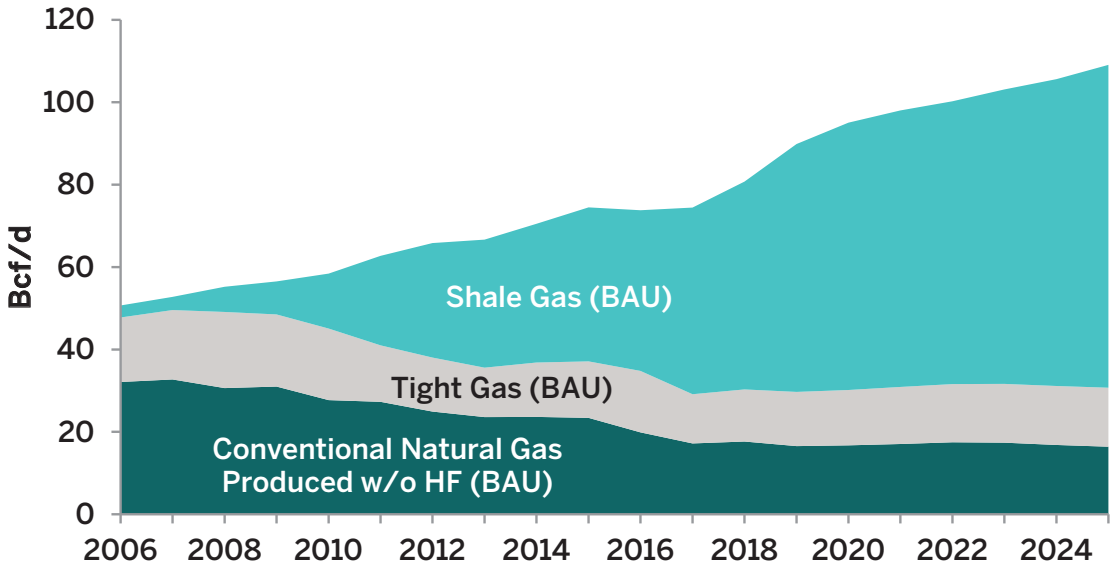
Source: EIA Annual Energy Outlook 2019

Figure 3 is a reproduction of Figure 1 but separates "Natural Gas Produced with Hydraulic Fracturing" into the categories of "Shale Gas" and "Tight Gas." Figure 3 shows that shale gas production, which is the predominant growth engine of "Natural Gas Produced with Hydraulic Fracturing," grew from 2.9 billion cubic feet per day (Bcf/d) in 2006 to 50.5 Bcf/d in 2018. As it currently stands, shale gas is responsible for between 62 percent of the U.S. gas production.

Under its Annual Energy Outlook (AEO) Reference Case, the U.S. Energy Information Administration (EIA) forecasts natural gas production will grow to 100.3 Bcf/d in 2025, an approximately 24 percent increase relative to 2018 levels, driven by increases in shale production. This estimate for 2025 may even be too low. In recent years, EIA has often underestimated oil and natural gas output from shale formations, with actual trends more closely matching EIA's "High Oil & Gas Resource and Technology" side case. If technology develops more rapidly and new resources are added in keeping with this more optimistic EIA side case, output could rise even more – to as much as 109.1 Bcf/d in 2025, or 35 percent (28.3 Bcf/d) more than in 2018 — again, driven entirely by increases in shale production.

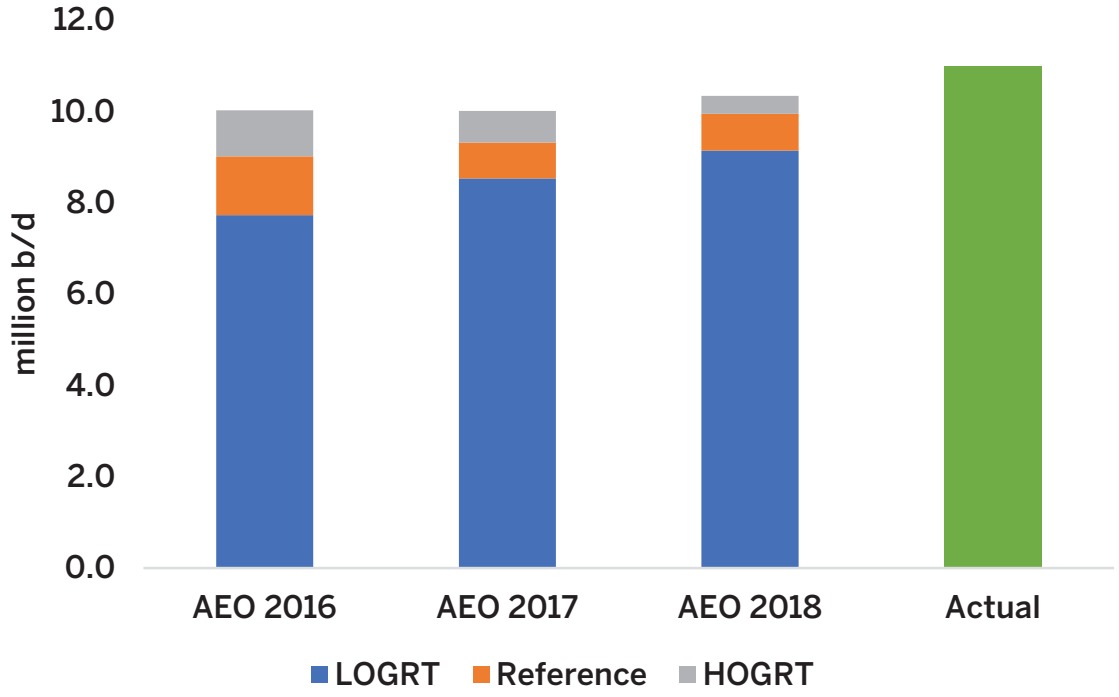
Since EIA's High Oil and Gas Resource & Technology (HOGRT) side case has done a better job of tracking market realities we have chosen to use it as the baseline for this analysis. Chart 1 and Chart 2 show that EIA's HOGRT, Low Oil and Gas Resource and Technology (LOGRT) case, and Reference case relative to actual 2018 crude oil and gas productions, respectively.

Figure 3: Historical & Forecasted U.S. Gas Production



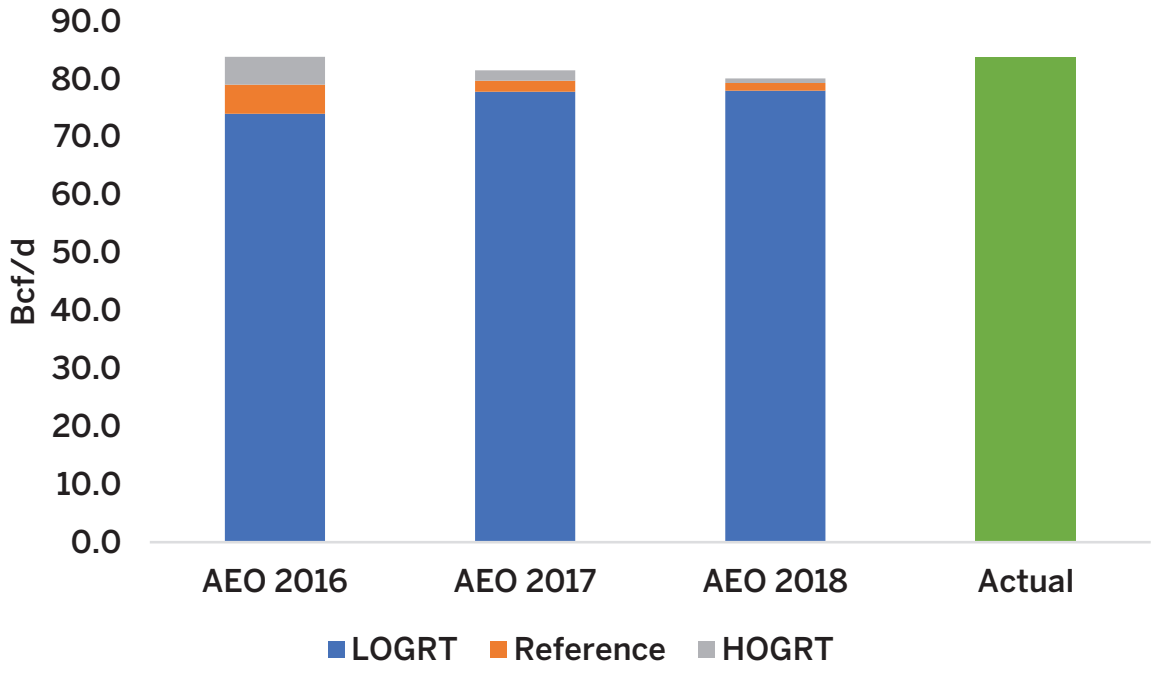
Source: EIA Annual Energy Outlook 2019

Chart 1: AEO Forecasted 2018 U.S. Crude Production by Case vs. 2018 Actual



Source: EIA Annual Energy Outlook 2016, 2017 and 2018

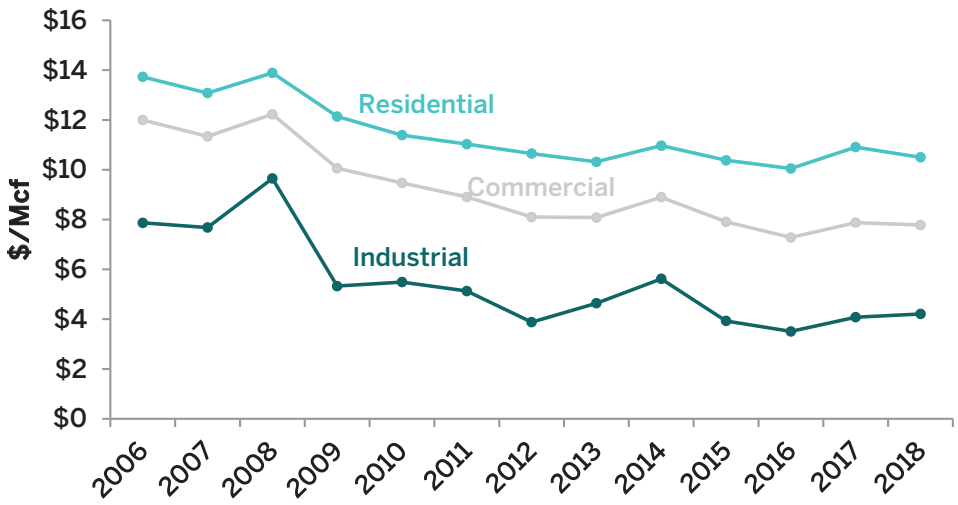
Chart 2: AEO Forecasted 2018 U.S. Gas Production by Case vs. 2018 Actual



Source: EIA Annual Energy Outlook 2016, 2017 and 2018

The rise in shale production greatly benefits American consumers and businesses, lowering prices for all goods and service. Figure 4 shows that delivered natural gas prices have dropped considerably from their peak in 2008. Industrial customers experienced a 56 percent decrease in prices, helping to lower prices for energy intensive manufactured goods while giving U.S. businesses a competitive advantage in global markets. Meanwhile, prices for residential and commercial consumers declined 24 percent and 36 percent, respectively. These reductions have translated into lower costs for businesses and families, freeing up spending to other value-added areas and investments.

Figure 4 - U.S. Delivered Natural Gas Prices



Source: EIA Annual Energy Outlook 2019

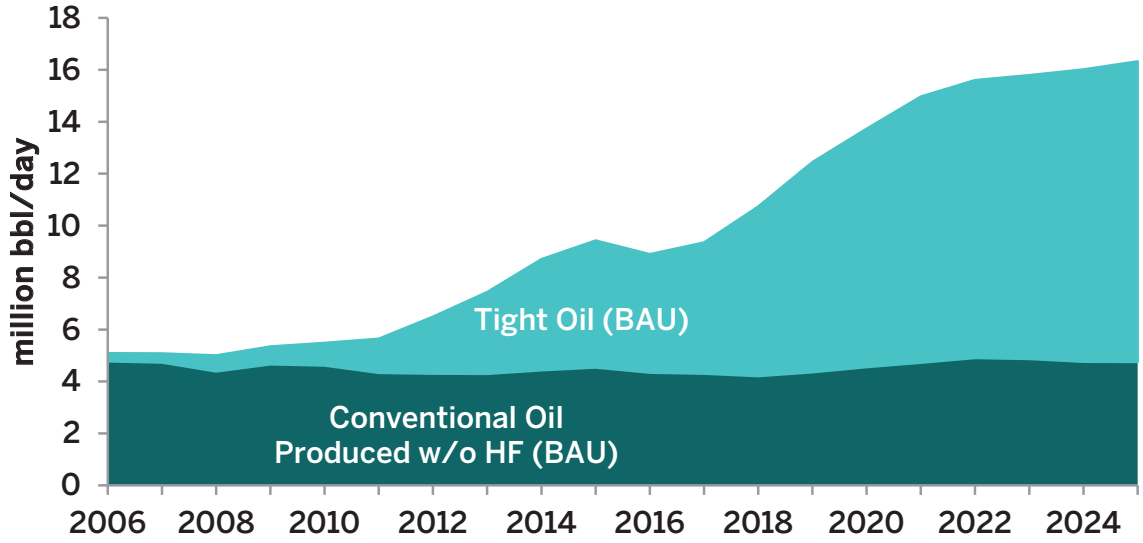
CRUDE OIL PRODUCTION AND PRICES

The significant growth in new domestic oil production also underscores the changing energy landscape in the United States. A decade ago, most of the crude oil produced in the United States came from conventional sources. In 2006, tight oil made up only six percent of the country's total crude oil production portfolio.

Today, much like natural gas, the massive increase in crude oil production is coming from unconventional sources. Hydraulically fractured tight oil formations now make up more than half of all U.S. oil production. Figure 5 shows that total U.S. crude production is expected to grow through 2025 – growth made possible by increases in tight oil production.

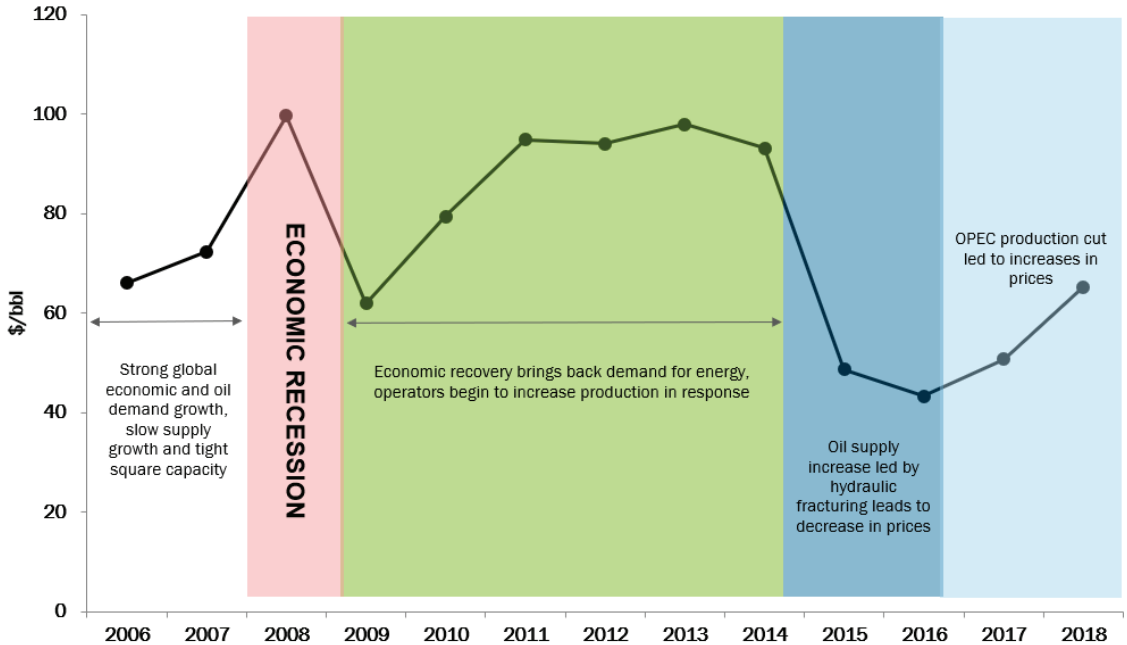
Over the past 10 years, dramatic fluctuations in the price of oil have injected uncertainty into energy markets. Prior to the recession in 2009, there were several years of strong economic growth that drove oil demand growth in developing nations. These more recent price swings in the primary U.S. oil benchmark over the past decade are captured in Figure 6.

Figure 5: Historical & Forecasted U.S. Oil Production



Source: EIA Annual Energy Outlook 2019

Figure 6: WTI Price History



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CHAPTER 2

A FUTURE WITHOUT HYDRAULIC FRACTURING: IMPACTS ON U.S. ENERGY SECURITY

Without question, becoming the world's largest producer of oil and natural gas has been a boon for the American economy. As a result, any policy that seeks to restrict that opportunity (i.e. a hydraulic fracturing ban) would negatively impact almost every sector of the American economy. From upstream (oil and gas production) to downstream (industrial, commercial, and residential consumers), such a ban would impose myriad burdens on American families and businesses.

A ban would not only affect consumers of natural gas, transportation fuels, and electricity, but it would also harm those who use products relying on these low-cost inputs to operate their businesses. Necessities such as food, medicine, and housing rely on oil and natural gas – supplied by hydraulic fracturing – for important components and materials, including packaging, cooling, heating, and transportation. Billions of dollars in new manufacturing investments in the United States in recent years were made possible by the availability of affordable natural gas, unlocked by hydraulic fracturing technology. Without access to reliable and affordable energy supplies, many if not most of these investments would be placed at risk.

As noted earlier, in 2018, 78 percent of U.S. natural gas production and 61 percent of U.S. crude oil production came from wells that were hydraulically fractured. Using field declines rates, combined with other key assumptions, the Global Energy Institute developed a macroeconomic impact analysis around a future without hydraulic fracturing. This future was compared to a BAU future where the opportunities from hydraulic fracturing are allowed to continue under the current set of laws and regulations. As noted earlier in this report, the BAU was based on the EIA's Annual Energy Outlook 2019 case entitled High Oil & Gas Resource and Technology.

EIA's Reference Case has historically underestimated the prospects for shale oil and gas production and its impact on energy prices, while the AEO's low price forecasts historically have been better predictors of future gas prices.

Key assumptions for the hydraulic fracturing ban future include the following:

NATURAL GAS PRODUCTION, CONSUMPTION AND PRICE ASSUMPTIONS

- Conservatively assumes hydraulic fracturing is only applied to shale and tight oil and gas plays, even though it is used in other types of plays.
- Applies an annual production decline rate of 23.7 percent to existing shale gas plays if no new wells were drilled.
- Readjusts future U.S. consumption of natural gas downward based on the summation of declining future production plus net pipeline imports and net liquefied natural gas (LNG) imports.
    - For net pipeline imports, the analysis assumes that natural gas exports to Mexico would drop to the historical low levels experienced between 2004 and 2008 when natural gas prices were two to four times higher than today's prices.
    - Similarly, this analysis assumes that Canadian pipeline imports would rise to the historical highs experienced between 2004 to 2008.
    - Assumes that the United States would import up to its regasification terminals capacity at 75 percent utilization.
- Uses the price elasticity of natural gas demand implied in EIA's AEO 2019 cases to determine the new Henry Hub gas price.

U.S. CRUDE OIL PRODUCTION, CONSUMPTION, AND PRICE ASSUMPTIONS

- Conservatively assumes hydraulic fracturing is only applied to tight oil plays, even though it is used in other types of plays.
- Applies an annual production decline rate of 33 percent to existing tight oil plays if no new wells were drilled.
- Assumes in a world where supply is artificially limited that oil and natural gas prices would return to the tight relationship seen from 2006 to 2008, where the West Texas Intermediate (WTI) crude oil price to Henry Hub gas price ratio averaged 11:1.
- Assumes U.S. crude oil consumption consistent with EIA's AEO 2019 Low Oil and Gas Resource and Technology Case.

ELECTRICITY PRICES AND CONSUMPTION

- Computes the average wholesale electricity price to Henry Hub gas price multiplier during 2008-2018 using EIA average price of electricity delivered to ultimate customers.
- Forecasts end-consumer prices by applying the average multiplier to Henry Hub gas prices.
- Uses a power market model to determine the change in electricity consumption under higher prices.

NATURAL GAS PRICE IMPACTS

In 2017, for the first time in 60 years the United States became a net natural gas exporter.[1] Oil exports are also growing rapidly. After a 40-year ban on exporting crude oil ended in December 2015, the United States began exporting crude oil to international markets.[2] Forecasts show these trends will only continue, as U.S. resources gain market share in domestic and foreign markets alike. However, if hydraulic fracturing were banned, the opposite would happen, leading to an increased reliance on imported energy to meet domestic consumption, and therefore leaving the country more exposed to the whims and demands of foreign suppliers and to international price volatility.

It is important to recognize that for many years the price of natural gas in the United States was closely linked to the price of crude oil, as it is in other parts of the world. Due to the abundance of natural gas unlocked by hydraulic fracturing, however, this linkage has been severed, and natural gas prices now respond more to natural gas supply and demand economic fundamentals and not to the price of crude oil. Should hydraulic fracturing be banned, it is likely that the linkage between oil and natural gas prices would be reestablished, potentially putting the price of natural gas in the hands of OPEC and Russia.

Moreover, shale gas production from existing wells would decline, meaning limited domestic supplies would quickly force the U.S. to reverse the trajectory of becoming a major global LNG exporter and once again become an importing nation.

Currently, shale production is about 50.5 Bcf/d or 62 percent of U.S. production. Under a hydraulic fracturing ban, production from existing sources would drop significantly due to the field production decline rates. Similarly, natural gas production from tight gas formations would drop quickly as well, since they rely on hydraulic fracturing to generate production. Figure 7 shows the combined impact of banning hydraulic fracturing and the resulting decline from shale and tight gas formations.

To be conservative, however, the Global Energy Institute developed its "no hydraulic fracturing" natural gas price forecast and consumption forecast by using the implied price elasticity of demand from EIA's AEO cases. The result for projected LNG and pipeline analysis is shown in Figure 8 and the price forecast analysis is shown in Figure 9.

In a future where hydraulic fracturing is banned, the systemic shocks to the global oil and gas markets would be immense. Oil and gas prices would be based on scarcity pricing, as supply would be significantly reduced and demand would be inelastic in the short-term.

As we can see, by 2023 Henry Hub natural gas prices under the hydraulic fracturing-is-banned scenario rise to levels not experienced since 2008. Prices rise further from there, to more than $12.30 per MMBtu in 2025. These price points are comparable to where international LNG prices were between 2010 and 2014 when supply was tight and demand was growing rapidly.

Figure 7 - U.S. Natural Gas Production and Consumption under a Hydraulic Fracturing Ban

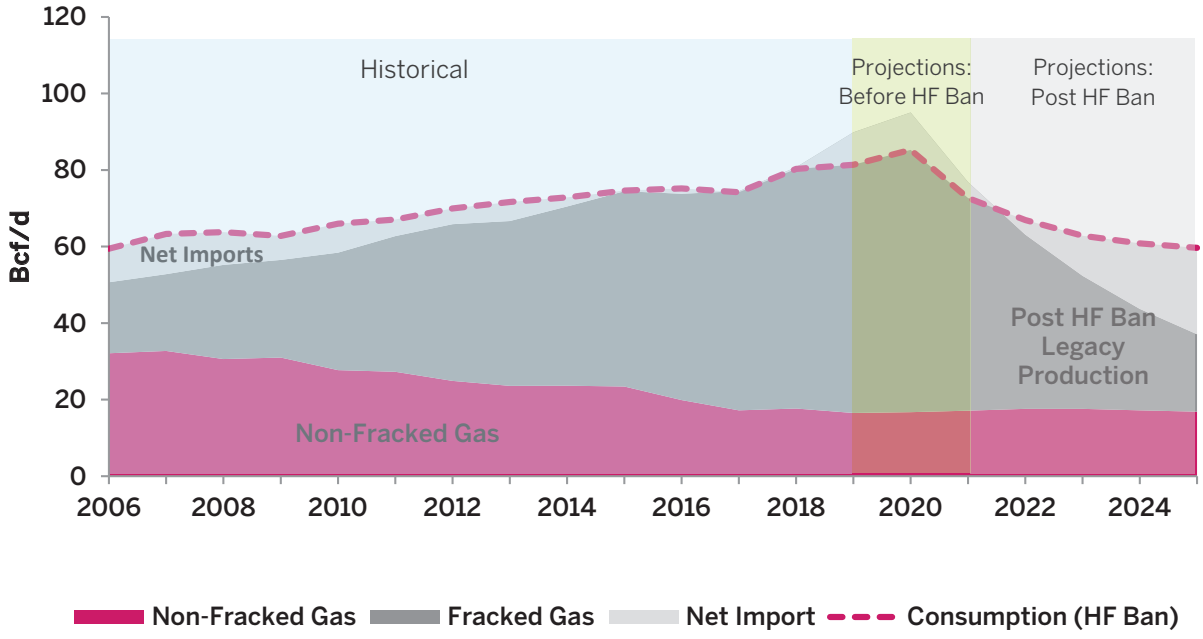


Figure 8 - Projected Net Imports (Pipeline and LNG) under BAU and No HF Scenarios

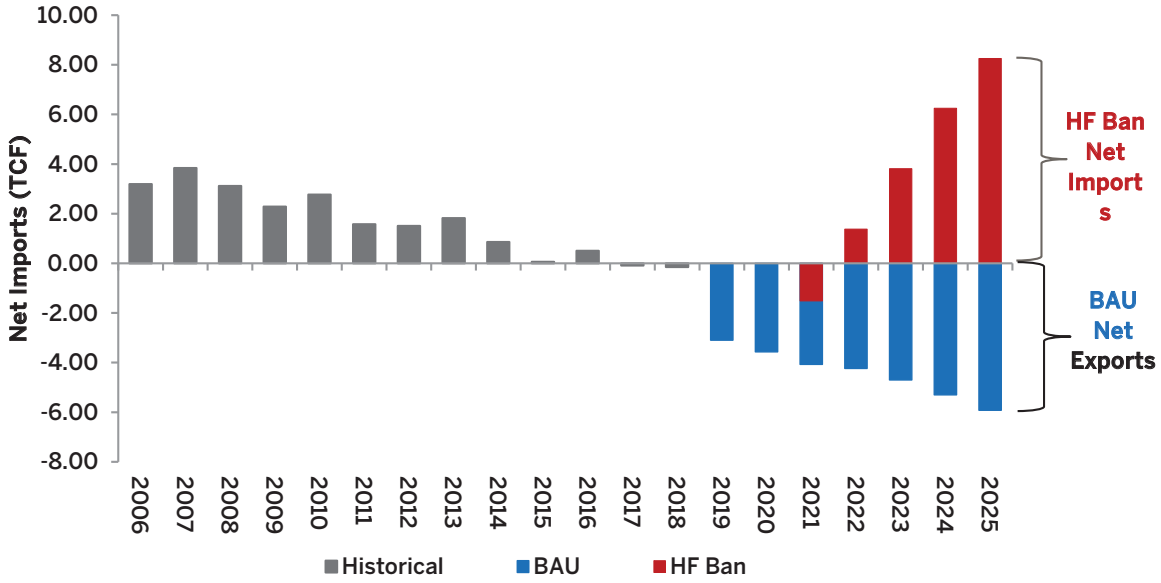
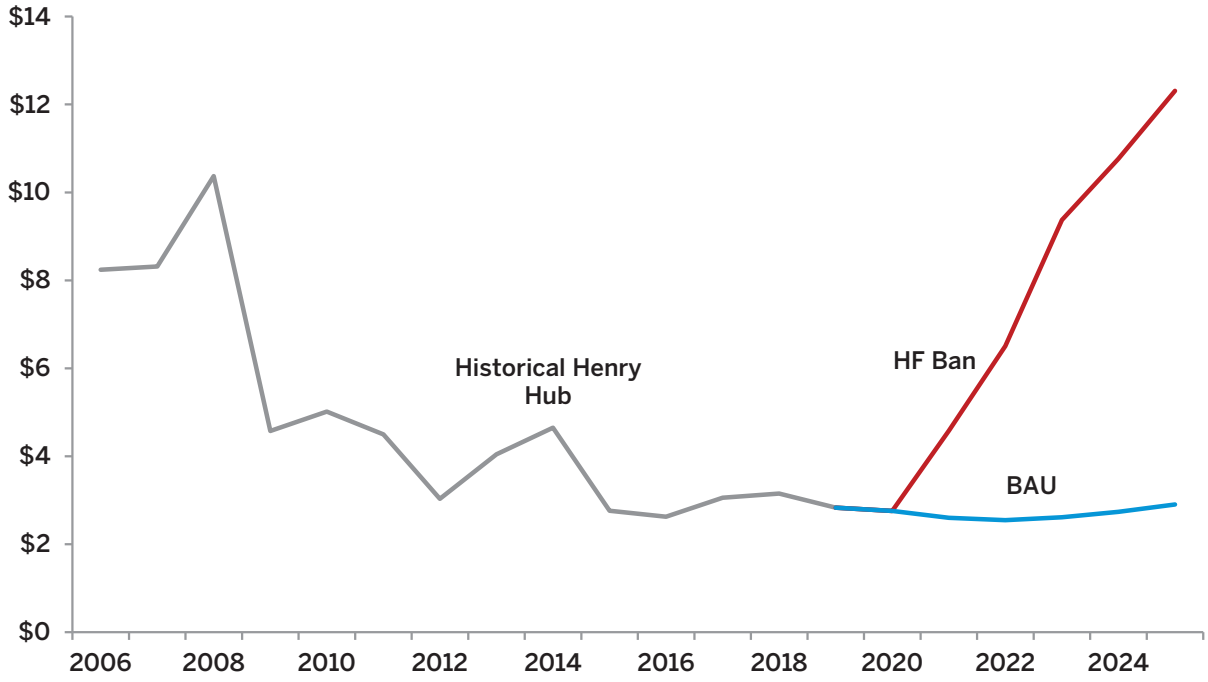


Figure 9 - Historical and Forecasted Henry Hub Natural Gas Prices



CRUDE OIL PRICE IMPACT

The global crude market has been in an oversupply situation since 2014, when the growth in U.S. shale production became fully appreciated by the marketplace and when signs of global demand growth, particularly in China, became apparent. Figure 10 illustrates the global petroleum and supply demand imbalances since 2006. With a global supply shortage, this analysis forecasts crude prices to reach $130 per barrel in 2025 (Figure 11). Crude oil demand has shown to be inelastic, especially in the short term. Figure 12 shows the expected consumption and production under a hydraulic fracturing ban scenario.

Figure 10 - Global Petroleum and Liquids Supply and Demand Balance

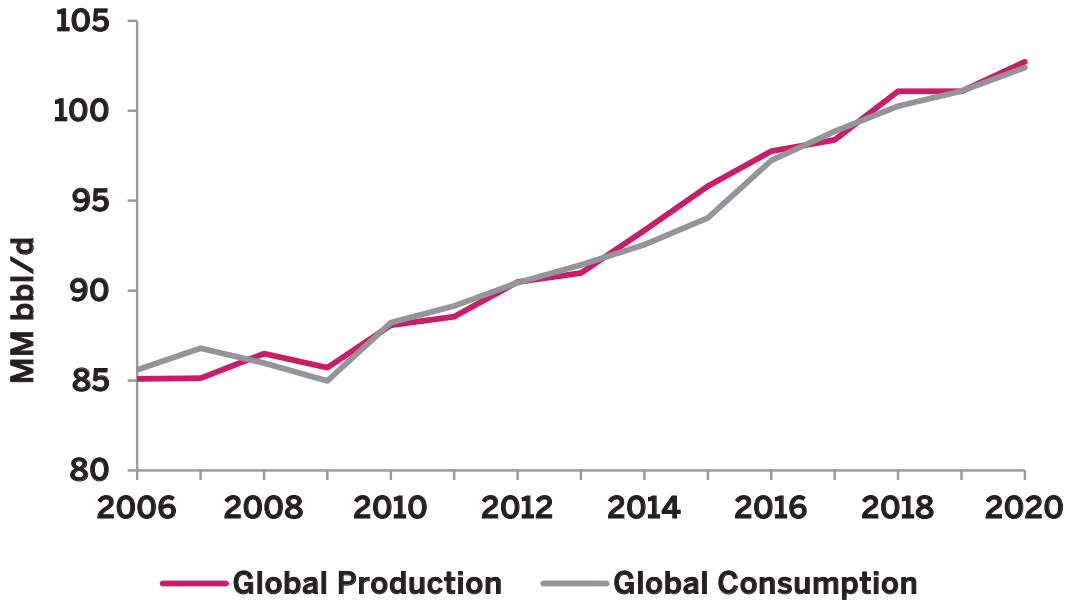


Figure 11 - Historical and Forecasted WTI Prices

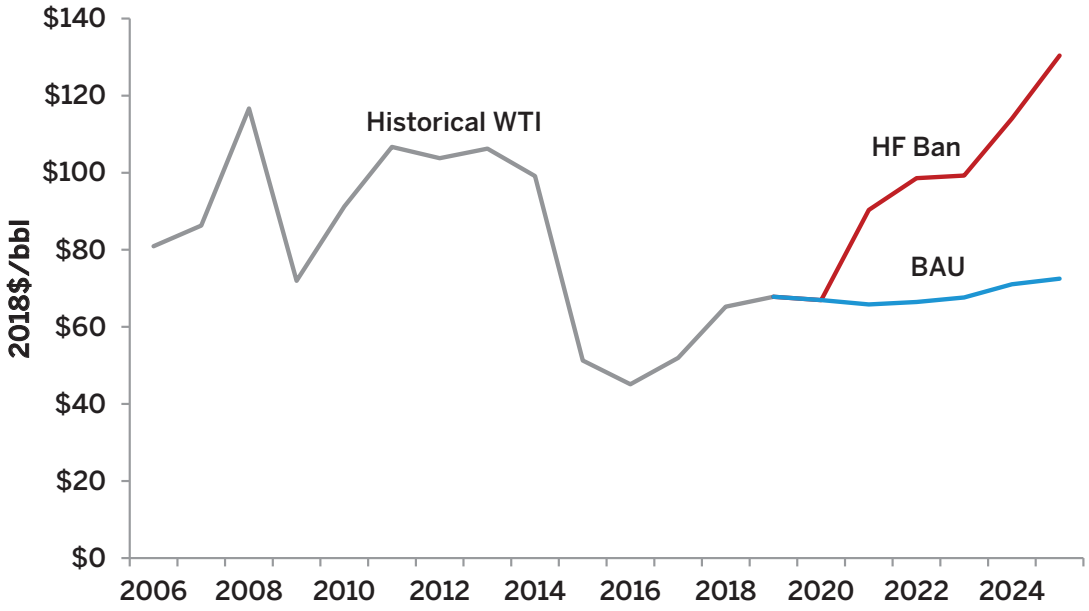
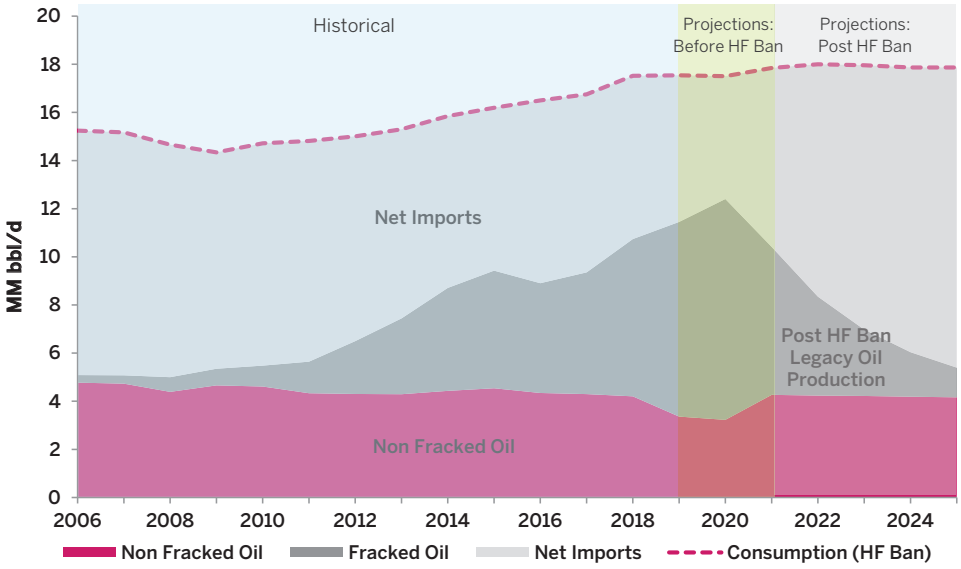


Figure 12 - U.S. Crude Production under Hydraulic Fracturing Ban



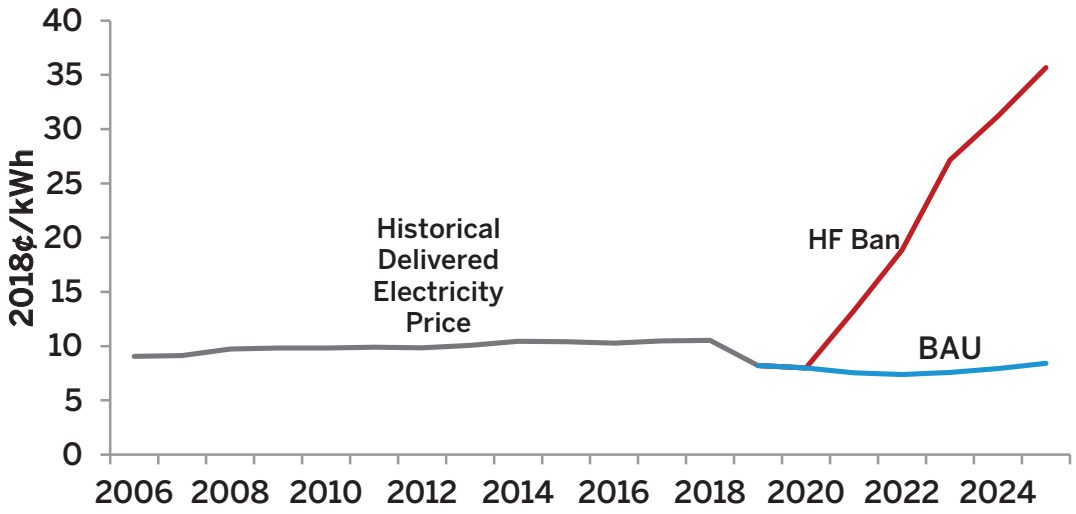
ELECTRICITY PRICES

Over the past decade, average electricity prices for all consumers – residential, commercial, and industrial – have been kept in check. This is a direct result of hydraulic fracturing and the shale energy renaissance. Declining natural gas prices have been able to offset rising fixed costs that are imbedded within delivered electricity prices. In 2018, natural gas solidified its status as the largest fuel source for electricity, fueling 35 percent of all U.S. electricity generation.

Figure 13 shows that delivered electricity prices would quadruple in 2025 if hydraulic fracturing were banned. Businesses would see a huge spike in operating costs and residents would see their monthly electricity bills skyrocket.

This is a stark reminder that the shale renaissance protects American consumers by enabling lower energy rates, and making the United States more competitive by reducing costs for companies that choose to invest here.

Figure 13 - Historical and Forecasted Average Delivered Electricity Prices



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CHAPTER 3

A FUTURE WITHOUT HYDRAULIC FRACTURING: IMPACTS TO THE U.S. ECONOMY

This section describes the results of the macroeconomic "What If" scenario of banning hydraulic fracturing in the United States, starting on January 1, 2021 and running through 2025. By calculating what would happen if a ban on hydraulic fracturing brought the energy renaissance to an end, we are able to quantify the immense benefits that the shale renaissance has created for the U.S. economy.

METHODOLOGY

For this analysis, we used the IMPLAN model,[1] a well-known and widely used input-output model that tracks monetary transactions within the economy between different industries, the government, and households.

For example, a change within IMPLAN to reduce the real income of households (from higher energy prices) will reduce their purchases of other items, such as prepared food, which in turn harms the restaurant industry, its wholesale suppliers, and the food processing and agriculture producers behind that. Here again we are reminded that the benefits of the shale renaissance are not limited to the oil and gas industry, but rather reverberate to non-energy sectors, including small business owners.

In recent years, revenues from expanded oil and gas production have been critical funding sources for much needed investments in infrastructure, public safety, and education. In New Mexico, revenues from the shale renaissance have given the state an enormous budget surplus, such that the state is now offering free in-state college tuition to all residents. Under a hydraulic fracturing ban, these benefits are not realized. Indeed, governments experience losses in tax revenues associated with labor and capital income, which are lower because of a ban on hydraulic fracturing. Lower energy production and higher energy prices affect all households and industries throughout the U.S. economy and lead to lower employment, less gross domestic product, and reduced labor income.

IMPLAN is a static model, and while we modeled changes that could occur during the five-year period of 2021 - 2025, this analysis makes a few small methodological assumptions to work around its static nature.

First, the analysis only examines the question through 2025, rather than the obvious long-term implications a ban on hydraulic fracturing would have for the U.S. economy and energy industry throughout the late 2020s and into the 2030s. By concentrating on the short-term, we can discuss the impacts before any large, structural shifts in the production or consumption of energy in the United States. For example, the mass adoption of electric cars or vast increases in renewable power generation would change the nature of the automotive and power generation sectors and affect their impact on the broader the economy.

Even under a scenario in which these significant structural changes were to happen, they would not happen quickly – certainly not with the myriad infrastructure, supply chain, regulatory, and technological challenges that would need to be addressed before any transition of this scale were to take place. As a result, we believe that conducting our analysis within a five-year window via IMPLAN is an appropriate duration to consider before large structural shifts in the economy might or might not occur.

MODELING INPUTS AND ASSUMPTIONS

For the simulations in IMPLAN, we included four types of changes. The numerical inputs for these changes originate in changes to energy prices and production described in the previous sections. This section describes the four changes made in IMPLAN, the inputs to the model, and the major assumptions behind them:

CHANGES IN REAL LABOR INCOME

One of the important impacts of a ban on hydraulic fracturing would be higher prices for residential consumers of petroleum products, natural gas, and electricity. In the short term, as prices rise, consumers would tend to shift more of their income towards the purchase of energy at the expense of other items. Energy commodities are generally "inelastic" in the short term with large changes to price engendering only small fluctuations in demand. This can lead families to forego paying other bills or even spend less on other necessities like groceries.

We used the implied price elasticity of demand from EIA's AEO[2] to determine how much income residential consumers would reallocate towards higher energy prices and away from other consumption items. Subsequently, we analyzed reductions in consumer spending on other, non-energy items through IMPLAN's consumption equation, which estimated the actual goods and services that would see reduced demand because households were spending more on energy and less on other purchases, such as less spending on electronics or travel.

CHANGES IN ENERGY PRICES FOR BUSINESSES

To calculate the impact of higher energy prices on businesses (e.g., commercial and industrial consumers), we used a similar approach to the one for residential customers. The commercial and industrial sectors have the same generally inelastic response to higher energy prices. When more and more of their revenue goes towards covering higher and higher energy bills, they have less money for investments, inputs, or wages and salaries.

We spread the total impact for the commercial or industrial sector across the industry sectors in IMPLAN based on the model's implied energy demand by sector. For instance, the sectors with the largest demand for petroleum products are state and local governments (with their large fleets of mass transit vehicles and school buses), truck transportation, and air transportation. The largest for natural gas include petrochemical manufacturing and nitrogenous fertilizer manufacturing. The largest commercial and industrial consumers of electric include real estate, wholesale trade, and other sectors with large buildings to light and air condition, such as the hospitality sector.

We then reduced the output of these sectors in the IMPLAN model to show the impact on the economy from higher prices.

CHANGES IN ENERGY PRODUCTION JOBS

Without hydraulic fracturing available as a well completion technology, total drilling and extraction activities in the U.S. would decline. Using the figures from the previous sections, we estimated the number of direct jobs lost in the drilling, exploration, and extraction industries.

We allocated the lost production between the states based on historical shale production by state. For petroleum, the largest direct impacts were in Texas and North Dakota. For natural gas, the largest impacts were spread more throughout the country but concentrated again on Texas as well as Oklahoma and Pennsylvania.

CHANGES IN ENERGY PRODUCTION MARGINS

A ban on hydraulic fracturing would reduce U.S. energy production and increase energy prices. The previous section discussed the producers put out of business by the ban, but other producers, who do not rely on hydraulic fracturing as a completion technology, may benefit from higher prices for petroleum and natural gas.

We have included this "windfall" margin for the remaining producers in the IMPLAN model as additional household income, which then becomes consumer spending through IMPLAN's consumption equation. The notion behind this is that the higher margins for remaining producers would accrue to the general economy through the higher profits for proprietors, additional royalties for landowners, and additional shareholder income (either through dividends or higher equity values) for those owning stock in publicly-traded energy companies.

We distributed these margins throughout the states based on two criteria with each weighted equally. Half of the margin went to the states with conventional oil and gas production, embodying the increased margins for the local energy industry like landowners. We divided the other half between the states based on their share of dividends, interest, and rent – capital income – according to the Bureau of Economic Analysis.

DISCUSSION AND IMPLICATIONS

Our analysis demonstrates that hydraulic fracturing is essential for a strong U.S. economy and stable energy markets. If it were banned, WTI prices for crude oil would surge from their current levels below $70 per barrel to over $130 per barrel in 2025. At the Henry Hub, natural gas prices would see even more intense changes, going from around $3 per MMBtu at present to around $12 per MMBtu by around 2025.

The higher energy prices would be tremendously detrimental to the U.S. economy. Residential consumers would reallocate spending away from the sectors dependent on consumer spending, and toward higher energy prices. Commercial and industrial consumers would have less money for investments, the purchase of inputs or new technologies, and the hiring and retention of employees.

The U.S. economy would also lose the direct jobs and economic activity associated with shale oil and gas production in states such as Texas and Pennsylvania. The windfall to conventional producers would provide a small cushion against these economic shocks, but would represent only a small fraction of the impact. The net impact across the entire U.S. economy from a hydraulic fracturing ban would be on par with a major economic crisis.

In 2025, the U.S. would lose around 19 million jobs and $2.3 trillion in GDP. For comparison, this is roughly three times the economic impact of the Great Recession of the late 2010s. From the peak in 2007 to the trough of the recession a few years later, the total number of annual U.S. jobs fell by 6.6 million.[3] While not as sudden as the financial crisis and the Great Recession, the impact of banning hydraulic fracturing would be a catastrophic economic event.

The U.S. has experienced an "energy price rollercoaster" over the past 20 years. For example, WTI prices once crested above $130 per barrel in 2008 before crashing to around $40, stabilizing between a range of $80 - $100

per barrel for around five years, and plunging as low as $35 per barrel before rising again in the past two years. Gasoline prices have fluctuated between $2 per gallon and $4 per gallon for the average U.S. consumer from 2005 to the present.

This price volatility in energy prices raises an important question – if the United States can survive the past shocks without large economic letdowns, why would it not again? The answer is the specific policy of banning hydraulic fracturing has the effect of eliminating some of the self-correcting features of the U.S. economy that spring into action when energy prices rise and fall, ones that soften the blow on U.S. households, consumers, and businesses.

According to Christiane Baumeister and Lutz Kilian of the Brookings Institute:

Our analysis suggests that this decline produced a stimulus of about 0.7 percentage points of real GDP growth by raising private real consumption and an additional stimulus of 0.04 percentage points reflecting a shrinking petroleum trade deficit. This stimulating effect, however, has been largely offset by a reduction in real investment by the oil sector more than twice as large as that following the 1986 oil price decline. Hence, the net stimulus since June 2014 has been effectively zero.[4]

As energy prices decline, the consumer and industrial economies increase their consumption and output while the energy extraction, processing, and distribution sectors decrease their production. In times of high prices, the opposite situation arises, cushioning any macroeconomic shock on the other side of the ledger. The U.S.' rather unique position as both a large energy consumer and large energy producer provides built-in stability against fluctuations in national and world energy prices, which means the business cycle in the United States generally turns on other factors, such as trade, consumption, or the financial sector.

This process, while relatively equal on the national scale, is not uniform regionally. States and regions with large service sectors and large populations, such as the Northeast corridor and large metropolises on the West Coast, generally benefit from lower energy prices. Appalachia, the Southwest, parts of the Mountain West, and Alaska are more likely to benefit from higher prices. Areas with large economies, populations, and energy sectors are likely to have a more mixed impact, such as the industrial Midwest and parts of the Southeast.

Disallowing hydraulic fracturing would shrink the size of the U.S. energy industry and eliminate its ability to cushion the economy against large swings in prices. A ban on hydraulic fracturing would essentially be the worst of both worlds – low production as if prices were low, while the rest of the economy (in the form of millions of households and businesses) struggles to adapt to a doubling of oil prices and quadrupling of natural gas prices.

Under normal circumstances, absent the ban, much of this kind of downturn would dissipate when energy producers increased their investments and production activities, keeping the capital and labor inside of the U.S. economy utilized, and helping prevent the economy from slipping into a recession.

Two other important ways macroeconomic shocks can be softened include monetary policy and federal fiscal policy. The Federal Reserve can decrease its funds rate, lowering interest

rates and increasing investment to boost the U.S. economy. The funds rate, however, is currently less than 2 percent.[5] Such low rates give the Federal Reserve limited space to lower interest rates to fight a downturn. With fiscal policy, the federal government is currently running a deficit of $1 trillion, which might limit its ability to expand spending further during a crisis.

Additionally, without hydraulic fracturing technology, the U.S. would again become a large net importer of energy. These imports would send trillions of dollars in value to exporting nations, either directly through trade or by increasing the world price of petroleum. Indeed, a hydraulic fracturing ban would shift this value away from American producers, their employees, and American households and businesses towards those controlling the petroleum and natural gas sectors in other countries.

If the U.S. were a large net importer of crude oil again, then its macroeconomic situation would become much more like it was in the 1970s or 1980s, riding a series of oil price shocks up and down. Without hydraulic fracturing, the U.S. economy would be smaller and would suffer a painful contraction before adjustment to a low production and high energy price future – leading to more volatility and susceptibility to swings in world energy prices.

MODELING RESULTS

UPSTREAM IMPACTS

To better understand the influence that a ban on hydraulic fracturing would have on the economy, we first estimated the number of jobs that would be lost in the upstream oil and gas industry over a five-year period, focusing both on our seven target states (Ohio, Pennsylvania, Colorado, Texas, New Mexico, Michigan, and Wisconsin) and the U.S. economy writ large.

As shown in Table 1, although the hemorrhaging of jobs would begin relatively slowly in 2021, the pace of losses picks up considerably as we approach 2025 and beyond, culminating in more than one million jobs lost just in the upstream oil and gas sector in 2025.

Table 1: U.S. Oil and Natural Gas Sector Jobs Impacts (thousands)

Region	2021	2022	2023	2024	2025
Ohio	-4	-8	-11	-14	-17
Pennsylvania	-5	-9	-13	-17	-21
Colorado	-18	-29	-37	-44	-49
Texas	-160	-258	-323	-388	-437
New Mexico	-9	-15	-18	-22	-25
Michigan	-1	-1	-1	-2	-2
Wisconsin	0	0	0	0	0
Other states	-160	-260	-331	-402	-459
U.S.	**-357**	**-581**	**-734**	**-888**	**-1,010**

MACROECONOMIC IMPACTS

Although a ban on hydraulic fracturing would be devastating to oil and natural gas workers, the harm this policy could inflict on the larger U.S. economy – even in states where no discernable fracturing activity takes place at all – is much greater.

Affordable energy provides more disposable income for American families and reduces costs for American businesses, which in turn enhances American competitiveness in the global market. Those lower costs also allow companies to hire more workers and invest in new technologies, and the additional spending from increased disposable income provides a boost to businesses in the service industry.

Contrast these benefits with a scenario in which hydraulic fracturing were banned. Restricted access to oil and natural gas would mean higher energy costs for American families, who would have less disposable income to spend – which in turn inflicts harm on local businesses. Higher energy costs for businesses means not only fewer jobs created, but also fewer resources to support existing employees. Service industries and suppliers would also contract, causing even more jobs to be lost.

Table 2 captures and quantifies the jobs our modeling indicates would be lost under a hydraulic fracturing ban scenario. Including the higher energy costs that residential consumers and businesses would experience under a ban as well as the jobs that will be destroyed in the upstream energy sector, our analysis indicates that more than 19.4 million American jobs in total would be lost in 2025.

Of course, any time an implemented policy has the effect of wiping out significant numbers of existing jobs, it also tends to have a measurable impact on GDP. In the case of instituting a nationwide ban on hydraulic fracturing, the impacts would be immense.

Table 2: U.S. Jobs Impacts from Hydraulic Fracturing Ban (thousands)

Region	2021	2022	2023	2024	2025
Higher residential energy costs	-2,406	-4,048	-5,939	-7,187	-8,627
Higher business energy costs	-2,982	-5,191	-7,849	-9,575	-11,550
Upstream production losses	-1,041	-1,691	-2,137	-2,584	-2,938
Windfall profits	2,281	2,906	3,229	3,436	3,711
Total U.S. employment	**-4,148**	**-8,023**	**-12,695**	**-15,910**	**-19,404**

As Table 3 shows below, our modeling indicates that the cumulative impact to U.S. GDP from a hydraulic fracturing ban over the next five years could be in the trillions – **$7.1 trillion in cumulated GDP lost from 2021 to 2025**.

This figure combines both the economic costs of higher residential and industrial energy prices and the direct hit that such a ban would have on the oil and gas industry, its associated supply chain, and the spending of their employees.

Table 3: U.S. GDP Impacts from Hydraulic Fracturing Ban ($ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Higher residential energy costs	-$222	-$373	-$547	-$662	-$794	-$2,598
Higher business energy costs	-$340	-$591	-$891	-$1,093	-$1,324	-$4,239
Upstream production losses	-$170	-$277	-$350	-$423	-$481	-$1,701
Windfall profits	$209	$266	$296	$315	$340	$1,426
Total U.S.	**-$523**	**-$974**	**-$1,492**	**-$1,862**	**-$2,259**	**-$7,110**

When consumers and businesses are forced to spend more of their income to pay for energy, they naturally have less income available to spend in other sectors of the economy. This relationship is well understood but as Table 4 shows, the volume of household income that has the potential to be displaced under a hydraulic fracturing ban scenario is enormous. Notably, those who reside in states where no or little shale development activity even takes place would still see dramatic reductions in household income, due to the critical role that affordable energy plays across the entire U.S. economy. In 2025, the estimated decline in U.S. household income reaches nearly $1.2 trillion, with a cumulative impact over this five year period resulting in a $3.7 trillion reduction in household income.

Table 4: U.S. Household Income Impacts from Hydraulic Fracturing Ban ($ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Higher residential energy costs	-$125	-$211	-$310	-$375	-$450	-$1,471
Higher business energy costs	-$184	-$315	-$470	-$577	-$699	-$2,245
Upstream production losses	-$82	-$133	-$168	-$203	-$231	-$817
Windfall profits	$118	$150	$167	$177	$191	$803
Total U.S.	**-$273**	**-$510**	**-$782**	**-$978**	**-$1,189**	**-$3,732**

As outlined in Table 5, residential consumers in the United States would be forced to pay over $1,700 per year, per capita, over and above what they pay right now, just to be able to afford the volume and type of goods and services they consume right now. When evaluated over this five-year period, that total increases to $5,661.

Table 5: Cost-of-Living Increases for Residential Consumers ($ per capita)

Region	2021	2022	2023	2024	2025	Cumulative
Ohio	$489	$815	$1,184	$1,428	$1,709	$5,625
Pennsylvania	$417	$681	$970	$1,174	$1,412	$4,654
Colorado	$520	$908	$1,383	$1,673	$2,006	$6,490
Texas	$613	$1,036	$1,525	$1,859	$2,247	$7,280
New Mexico	$485	$822	$1,216	$1,480	$1,787	$5,790
Michigan	$442	$744	$1,902	$1,317	$1,575	$5,170
Wisconsin	$440	$706	$988	$1,207	$1,436	$4,777
Average U.S.	**$483**	**$813**	**$1,192**	**$1,442**	**$1,731**	**$5,661**

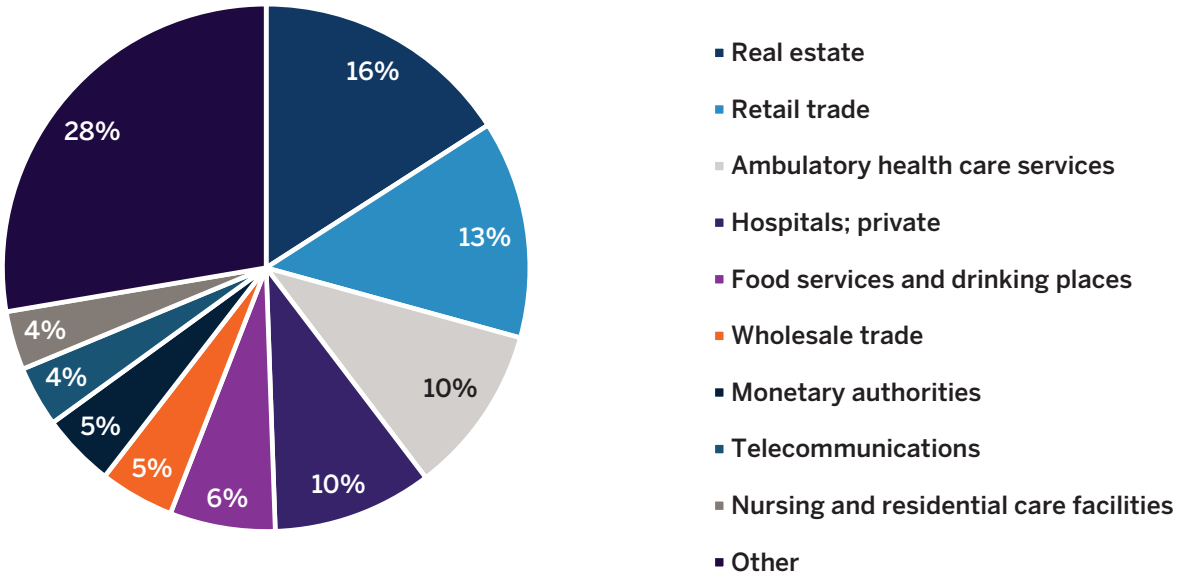
Table 6 shows that there are also large consequences to tax revenues at the local, state, and federal level, due to decreased production of oil and natural gas, and decreased purchasing of other goods and services by households. In 2025, state, local, and federal tax revenues could fall by nearly $600 billion with a cumulative impact of nearly $1.9 trillion.

Table 6: U.S. State, Local, & Federal Tax Revenues Impacts from Hydraulic Fracturing Ban ($ billions)

Region	2021	2022	2023	2024	2025	Cumulative
Higher residential energy costs	-$59	-$100	-$146	-$177	-$212	-$694
Higher business energy costs	-$91	-$158	-$238	-$292	-$353	-$1,131
Upstream production losses	-$42	-$68	-$86	-104	-$118	-$417
Windfall profits	$55	$70	$77	$82	$89	$372
Total U.S.	**-$137**	**-$255**	**-$393**	**-$490**	**-$595**	**-$1,870**

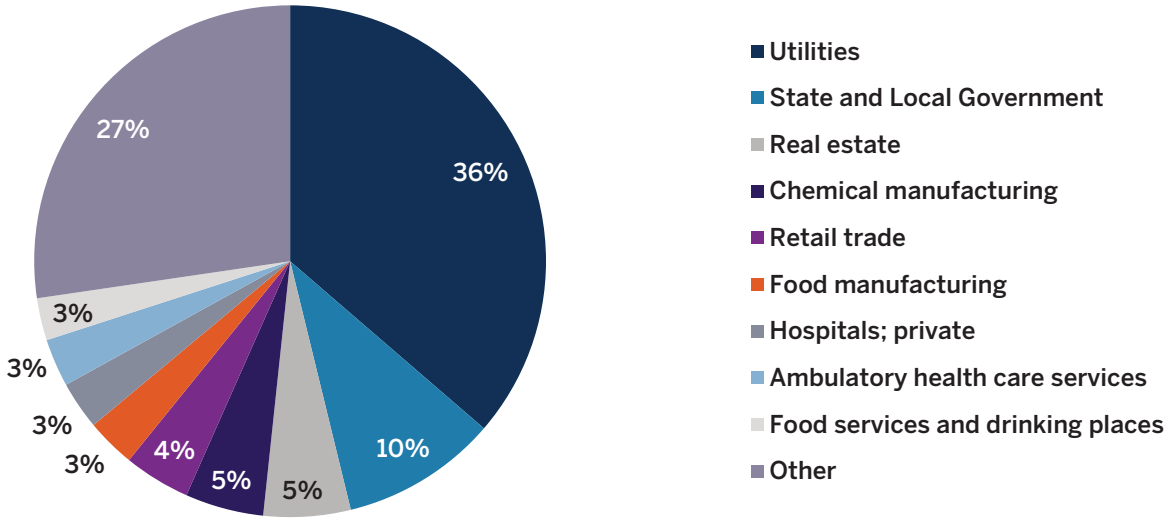
As part of our analysis, we also took a closer look at which specific sectors of the broader U.S. economy stood to be most impacted by the implementation of a nationwide ban on fracturing technology. Figure 14 tells an important story: As a result of higher residential energy costs, more than half of the total loss of GDP from a hydraulic fracturing ban would come from the real estate, retail, and healthcare sectors.

Figure 14: GDP Impacts to Top Sectors from Residential Energy Cost Changes (2025)



Natural gas cost changes affect two groups of consumers most severely – those who use natural gas to heat large areas, like retail stores, hospitals, and government buildings, and those who use gas in manufacturing processes, whether it be as a direct feedstock or for process heat. Figure 15 shows that the largest single sector impacted by higher natural gas costs is utilities, which distribute gas and burn gas to generate electricity for their customers.

Figure 15: GDP Impacts to Top Sectors from Natural Gas Cost Changes (2025)



Higher petroleum product prices hurt the petroleum and coal products manufacturing sector the most, as might be expected due to lower demand. Like residential cost increases and natural gas cost increases, however, real estate and retail trade are also severely impacted, with declines of 7 percent and 6 percent respectively. Logically, the transportation sector is more severely impacted than in the previous cases, with truck transportation and air transportation seeing declines of 6 percent and 4 percent, respectively, due to higher fuel costs.

Figure 16: GDP Impacts to Top Sectors from Petroleum Product Cost Changes (2025)

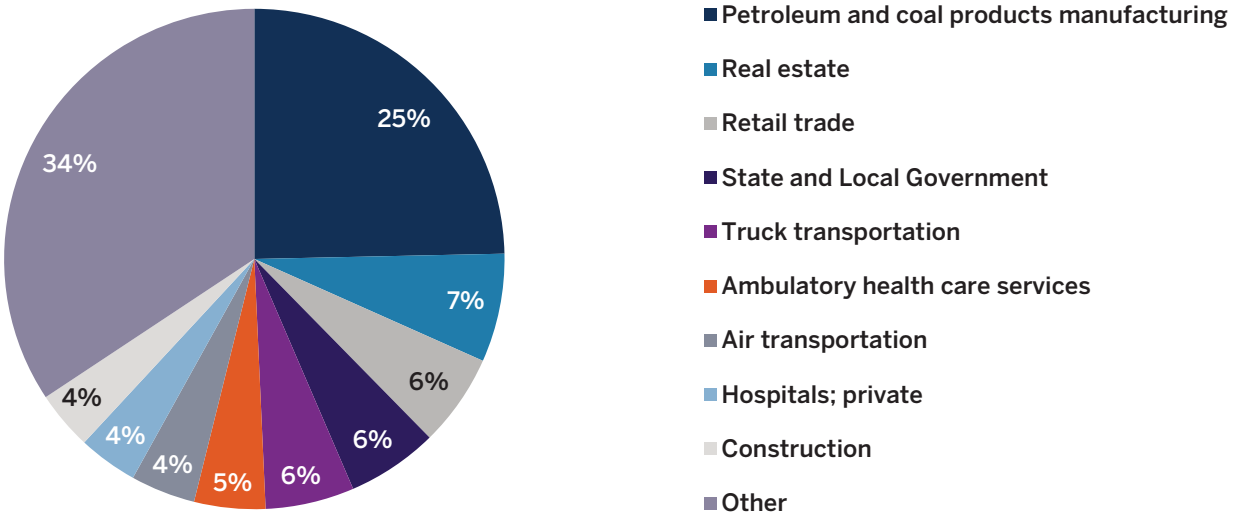
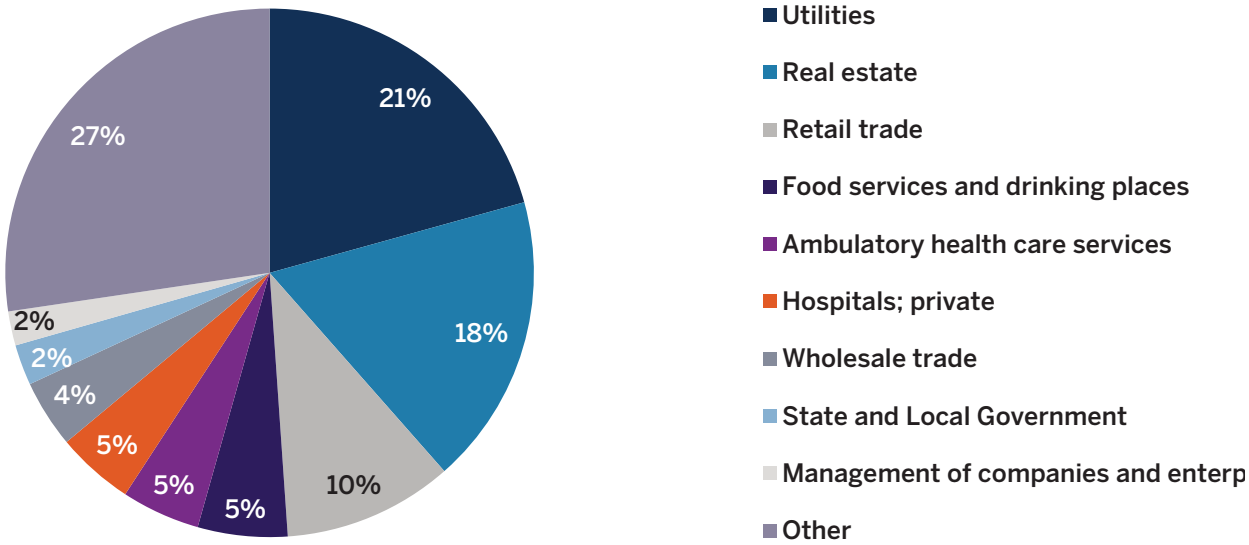


Figure 17 highlights the impacts associated with a scenario in which electricity prices were to increase significantly, which is precisely the outcome identified under our modeling. The largest impacts, unfortunately, are to a similar slate of industries as those discussed before, with real estate and retail being particularly hard hit, with GDP reductions of 18 percent and 10 percent respectively.

What this analysis demonstrates more than anything is that the shale renaissance is not just a story about the oil and gas industry – it's a story that underscores the benefits of American energy production are not limited to the energy sector.

Figure 17: GDP Impacts to Top Sectors from Electricity Cost Changes under a Ban (2025)



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CHAPTER 4

STATE-LEVEL IMPACTS (OH, PA, CO, TX, NM, WI, MI)

According to the U.S. EPA, hydraulic fracturing technology was utilized in "at least" 25 U.S. states[1] and accounts for about 61 percent of the crude oil production and 78 percent of natural gas production in the U.S.

As part of our analysis, we wanted to get a better sense of what the practical implications of a nationwide ban on hydraulic fracturing would be. We examined the states with the greatest volume of activity associated with the development of oil and natural gas from shale in recent years as well as two states with major manufacturing economies.

Among the seven states we chose to study, five - including Colorado, Ohio, Pennsylvania, Texas, and New Mexico – are within the top six oil or gas producing states U.S. states in 2018.[2,3] Two other states, Wisconsin and Michigan, do not have oil and gas production, but have manufacturing sectors that have significant energy consumption and will be impacted in a hydraulic fracturing ban scenario.

Oil and gas production in Colorado, Ohio, Pennsylvania, Texas, and New Mexico will decrease if hydraulic fracturing is banned.

Much more significantly, millions of jobs and associated income that would otherwise exist if hydraulic fracturing is allowed to continue would also be destroyed.

Among the seven states we studied, we found that nearly 5.9 million jobs would be lost by 2025 if hydraulic fracturing were banned starting in 2021. More than 3.1 million of those jobs would be lost in the state of Texas alone, the nation's leading oil and natural gas producer. Pennsylvania would lose an estimated 600,000 jobs, Ohio 700,000 jobs, and Colorado 400,000 jobs.

Those are all large numbers, of course, but the impacts of a nationwide hydraulic fracturing ban on these states become especially pronounced when analyzed on the per-household and per-capita levels. Our analysis finds that in 2025 household incomes would decrease in these states by billions of dollars per year, leading to a situation in which every person experiences a significant drop in annual income relative to what they would have otherwise had available. Table 1 summarizes these impacts.

Table 1: State-Level Impacts Summary (2025)

Region	Employment (thousands)	GDP (2018 $ billions)	Household Income (2018 $ billions)	Tax Revenues (2018 $ billions)	Cost of Living Increase ($ per capita)
Ohio	-700	-78	-38	-7	1,709
Pennsylvania	-609	-84	-37	-8	1,412
Colorado	-468	-58	-36	-5	2,006
Texas	-3,157	-472	-247	-33	2,247
New Mexico	-142	-26	-8	-3	1,787
Wisconsin	-300	-30	-16	-3	1,463
Michigan	-516	-51	-28	-4	1,575

Ohio

KEY FINDINGS (BY 2025)

- Job Impacts (in 2025): **-700,000**
- GDP Impacts: **-$245 Billion**
- Household Income Impacts: **-$119 Billion**
- State and Local Tax Revenues Impacts: **-$20.6 Billion**
- Federal Tax Revenues Impacts: **-$56.6 billion**
- Cost-of-Living Increase (per capita): **$5,625**

Ohio generated $676.2 billion in GDP in 2018,[4] had 5.5 million people in the workforce, and an unemployment rate of 4.6 percent, above the national average of 3.9 percent.[5] As a major manufacturing state, the manufacturing sector contributes to 17 percent of Ohio's GDP, more than 700,000 jobs, and $40 billion in labor income.[6]

Ohio's economy is on track to continue its expansion, with significant growth from oil and natural gas development in the Utica and Point Pleasant shale formations. The Utica formation holds large amounts of crude oil as well as wet natural gas, which can be processed to extract ethane, propane, and other natural gas liquids.[7] Due to hydraulic fracturing, Ohio's natural gas production surpassed state consumption for the first time in 2015.[8,9] In 2018, natural gas production in Ohio increased by more than 14 times its 2013 level, rising from less than 0.6 percent to 5.5 percent of the nation's total production during that period.[3]

Development of natural gas and liquids in eastern Ohio's Utica and Marcellus Shale has revitalized the Buckeye State's legacy oil industry as production has grown to record levels in recent years.[10] Natural gas production eclipsed 2.4 trillion cubic feet last year. The rise in production has generated significant investment in development and related manufacturing. A Cleveland State University study found shale-related investment in Ohio from 2011-18 reached $78 billion last year.[11]

Midstream and downstream investments have grown with production, as additional and expanded pipeline projects continue to be built to move natural gas and liquids from production areas to demand centers. Midstream companies like Marathon Petroleum Corporation's MPLX business unit have built massive processing facilities in southeast Ohio to separate natural gas liquids like ethane from dry gas for shipment on new pipelines. Some of that ethane will go to the $6 billion petrochemical facility Shell Oil is building in neighboring Pennsylvania.[12] Additionally, PTT Global Chemical is expected to make a final decision on whether to build its own petrochemical facility along the Ohio River in Belmont County.[13] Ohio officials expect additional manufacturing investment to come from Shell's and PTT's plants.[14]

Ohio is one of the 10 largest states by population and is among the top 10 total energy consuming states.[4] Natural gas used at Ohio's electric power plants has increased markedly in the past 10 years and was almost 14 times greater in 2018 than in 2008.[15] The electric power sector is the state's largest natural gas user, accounting for nearly 30 percent of total gas consumption, followed by residential customers who account for more than 25 percent.[16] The switch to natural gas for electricity has also spurred investments in new power plants in Ohio. The economic development agency JobsOhio lists about $1.5

billion worth of natural gas-fired power plant construction occurring in 2019.[17]

Our analysis helps quantify the size and scale of some of the impacts that Ohio residents would endure if hydraulic fracturing were banned. Ohio consumers will be hit hard by a ban on hydraulic fracturing, paying an additional $489 per capita for goods and services in 2021 compared to today and increasing to $1,709 per capita in 2025. Cumulatively, Ohio consumers will pay an astounding $5,625 more than today through 2025.

Table 2 summarizes the volume of jobs that would be lost as a result of this policy, accounting both for the jobs that would be impacted as a result of higher energy costs, as well as those associated with the decline of the upstream oil and gas industry in the state. All told, we find that nearly 700,000 jobs would be lost in Ohio in 2025.

If there were a ban on hydraulic fracturing, significant impacts on the state's GDP output and jobs will be inevitable. Our modeling indicates that between 2021 and 2025, $245 billion in state GDP would be lost, with many of those losses attributed to the higher costs for energy that Ohio businesses would be forced to pay.

All of the losses in state GDP translate into lost income for Ohio households, with residents losing more of their hard-earned money each year with the national hydraulic fracturing ban in place. If such a ban were implemented in 2021, our analysis finds that Ohio households would experience a $9 billion reduction in income in 2021, which would increase to a $38 billion reduction in 2025. On a cumulative basis, this results in a reduction in household income would total $119 billion, mostly driven by higher input and energy costs for businesses and consumers (Table 4).

Table 5 shows the impact to taxes paid in Ohio to state and local governments because of the ban on hydraulic fracturing. Between 2021 and 2025, this totals almost $20.6 billion, even accounting for the increase from the windfall revenues from conventional oil and gas producers. The Federal government would lose out on nearly $56.6 billion in tax revenues over that same period (Table 6).

Table 2: Ohio Jobs Impacts from Hydraulic Fracturing Ban (thousands)

Type of Economic Shock	2021	2022	2023	2024	2025
Due to higher residential energy costs	-90	-150	-218	-263	-315
Due to higher business energy costs	-110	-193	-296	-359	-431
Upstream production losses	-16	-27	-36	-45	-53
Windfall profits	61	78	86	92	99
Total Ohio employment impacts	**-155**	**-292**	**-464**	**-575**	**-700**

Table 3: Ohio GDP Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-7	-13	-20	-23	-28	-91
Due to higher business energy costs	-13	-22	-34	-42	-50	-161
Upstream production losses	-3	-4	-6	-7	-9	-29
Windfall profits	5	7	8	8	9	37
Total Ohio GDP impacts	**-18**	**-33**	**-52**	**-64**	**-78**	**-245**

Table 4: Ohio Household Income Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-4	-8	-10	-13	-16	-51
Due to higher business energy costs	-6	-11	-17	-21	-25	-80
Upstream production losses	-1	-1	-2	-2	-2	-8
Windfall profits	3	4	4	5	5	21
Total Ohio household income impacts	**-9**	**-16**	**-25**	**-31**	**-38**	**-119**

Table 5: Ohio State and Local Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-670	-1,120	-1,631	-1,969	-2,358	-7,748
Due to higher business energy costs	-1,069	-1,872	-2,864	-3,495	-4,215	-13,515
Upstream production losses	-215	-364	-498	-630	-763	-2,470
Windfall profits	461	588	653	695	751	3,148
Total Ohio tax revenues impacts	**-1,493**	**-2,768**	**-4,340**	**-5,399**	**-6,585**	**-20,585**

Table 6: Ohio Federal Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-1,842	-3,078	-4,484	-5,411	-6,481	-21,296
Due to higher business energy costs	-2,938	-5,146	-7,871	-9,605	-11,583	-37,143
Upstream production losses	-591	-1,000	-1,369	-1,732	-2,096	-6,789
Windfall profits	1,268	1,616	1,795	1,910	2,063	8,653
Total Ohio tax revenues impacts	**-4,103**	**-7,609**	**-11,929**	**-14,838**	**-18,097**	**-56,574**

Pennsylvania

KEY FINDINGS (BY 2025)

- Job Impacts (in 2025): **-609,000**
- GDP Impacts: **-$261 Billion**
- Household Income Impacts: **-$114 Billion**
- State and Local Tax Revenues Impacts: **-$23.4 Billion**
- Federal Tax Revenues Impacts: **-$50.3 billion**
- Cost-of-Living Increase (per capita): **$4,654**

Development of the Marcellus and Utica Shales has transformed Pennsylvania into the nation's second-largest producer of natural gas over the past decade,[18] spurring meaningful local job creation and investment in infrastructure and manufacturing.

The huge growth in natural gas production in an area that was historically a greater consumer of the fuel prompted a need for new and expanded pipeline infrastructure to move natural gas to high-demand areas – including a Philadelphia terminal repurposed for natural gas liquid exports.[19] Such development and investment in infrastructure continue to generate jobs.[20]

Natural gas has helped revitalize communities, not only in and close to production areas where new housing, hotels, restaurants, and other businesses have been established, but across the commonwealth due to an assessed per-well impact fee that has raised $1.7 billion for community projects, environmental programs and public safety initiatives.[21]

Shale development has also led to a resurgence in manufacturing, particularly in the petrochemical sector. Shell Oil chose Pennsylvania to build the first ethane cracker facility constructed outside the Gulf Coast in decades, and the $6 billion plant under construction is expected to attract additional manufacturing facilities looking to locate close to feedstock production.[22]

In 2018, Pennsylvania generated $788.5 billion in GDP, which ranked sixth among the states in 2018,[23] had nearly 6.15 million people in the workforce, and an unemployment rate of 4.3 percent, which is above the national average of 3.9 percent.[5] Pennsylvania is a leading East Coast supplier of coal, natural gas, and electricity to its own industries and to the nation.[24]

The disposable income of Pennsylvania households has increased due to the reduced energy bills. State real GDP has increased by $100 billion[25] and the unemployment rate decreased to almost half of the peak in 2010.[26]

Due to the development of the Marcellus Shale, the largest U.S. natural gas field, Pennsylvania's natural gas production has grown rapidly over the past decade. Pennsylvania's marketed natural gas production reached 6.2 trillion cubic feet in 2018, almost double that of 2013.[3] This is the first time that the state's annual natural gas production exceeded 6 trillion cubic feet, which is equal to about one-fifth of total national gas production, keeping Pennsylvania the second largest natural gas producer in the nation after Texas.[3]

Pennsylvania consumers will be hit hard by a ban on hydraulic fracturing, paying an additional

$417 per capita for goods and services in 2021 compared to today and increasing to $1,412 per capita in 2025. Cumulatively, Pennsylvania consumers will pay an astounding $4,654 more than today through 2025.

Our analysis finds that a ban on hydraulic fracturing would have the effect of displacing hundreds of thousands of jobs – creating impacts that would occur almost immediately. Table 7 summarizes these severe impacts, which culminate in 2025 with the loss of nearly 609,000 jobs that would otherwise exist absent a ban on fracturing.

A hydraulic fracturing ban would also take a significant bite out of the state's GDP. As Table 8 shows, the commonwealth would be projected to lose $261 billion in state GDP by 2025 if unconventional development comes to an end.

Like the situation in Ohio, but more serious, the impact of the overall ban on household income is mainly caused by the extra energy costs incurred by consumers and businesses. As shown in Table 9, we project that households in Pennsylvania will experience a collective loss in income of $114 billion by 2025.

The next table shows the state and local tax revenues supported by hydraulic fracturing in Pennsylvania. By 2025 without hydraulic fracturing, there would be $23.4 billion less in state and local revenues and almost $50.3 billion less in Federal tax receipts as noted in Table 10.

Table 7: Pennsylvania Jobs Impacts from Hydraulic Fracturing Ban (thousands)

Type of Economic Shock	2021	2022	2023	2024	2025
Due to higher residential energy costs	-86	-141	-202	-244	-293
Due to higher business energy costs	-96	-167	-251	-305	-366
Upstream production losses	-27	-44	-59	-73	-86
Windfall profits	84	107	119	126	136
Total Pennsylvania employment impacts	**-125**	**-245**	**-393**	**-496**	**-609**

Table 8: Pennsylvania GDP Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-8	-13	-19	-24	-28	-92
Due to higher business energy costs	-11	-19	-29	-35	-43	-137
Upstream production losses	-7	-12	-17	-22	-26	-84
Windfall profits	8	10	11	12	13	54
Total Pennsylvania GDP impacts	**-19**	**-35**	**-54**	**-69**	**-84**	**-261**

Table 9: Pennsylvania Household Income Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-8	-12	-16	-19	-22	-77
Due to higher business energy costs	-6	-11	-16	-19	-23	-75
Upstream production losses	-1	-2	-3	-4	-5	-15
Windfall profits	8	10	11	12	13	54
Total Pennsylvania household income impacts	**-8**	**-15**	**-24**	**-30**	**-37**	**-114**

Table 10: Pennsylvania State and Local Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-725	-1,196	-1,718	-2,079	-,2499	-8,217
Due to higher business energy costs	-1,018	-1,743	-2,594	-3,170	-3,835	-12,360
Upstream production losses	-650	-1,105	-1,528	-1,942	-2,366	-7,590
Windfall profits	696	887	985	1,048	1,132	4,748
Total Pennsylvania tax revenues impacts	**-1,697**	**-3,156**	**-4,855**	**-6,144**	**-7,567**	**-23,420**

Table 11: Pennsylvania Federal Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-1,556	-2,565	-3,688	-4,463	-5,363	-17,633
Due to higher business energy costs	-2,185	-3,740	-5,567	-6,803	-8,230	-26,525
Upstream production losses	-1,394	-2,372	-3,278	-4,169	-5,077	-16,289
Windfall profits	1,493	1,903	2,114	2,250	2,429	10,189
Total Pennsylvania tax revenues impacts	**-3,642**	**-6,774**	**-10,419**	**-13,185**	**-16,240**	**-50,259**

Colorado

KEY FINDINGS (BY 2025)

- Job Impacts (in 2025): **-468,000**
- GDP Impacts: **-$187 Billion**
- Household Income Impacts: **-$120 Billion**
- State and Local Tax Revenues Impacts: **-$14.9 Billion**
- Federal Tax Revenues Impacts: **-$28 billion**
- Cost-of-Living Increase (per capita): **$6,490**

In 2018, Colorado generated $368.8 billion in GDP,[27] and had 3 million people in the workforce with an unemployment rate of 3.3 percent, which is below the national average of 3.9 percent.[5] Advances in hydraulic fracturing in Colorado have not only strengthened the state's oil and natural gas industries – which support the state's impressively low unemployment rate – but also made the state a leader in environmentally conscious development.

Colorado accounts for more than four percent of U.S. total crude oil production[2] and holds four percent of the nation's economically recoverable crude oil reserves.[28] Its crude oil production has quadrupled since 2013,[2] partly from the increased use of hydraulic fracturing. Oil production declined in 2016 due to falling crude oil prices, but production rebounded and reached a record high in 2018 after oil prices rose.[29] The new production comes from the Niobrara Shale formation located in the Denver-Julesburg Basin in northeastern Colorado, accounting for almost 90 percent of crude oil drilled in Colorado.[30]

Colorado has the sixth-largest natural gas reserves in the United States,[31] and its natural gas production accounts for more than 7.5 percent of the U.S. total.[3] Colorado's natural gas output has more than doubled since 2001[3] and eleven of the nation's 100 largest natural gas fields are located entirely or partially in Colorado.[32]

Colorado is one of the top energy-producing states in the nation with the fifth-largest natural gas producing and sixth-largest crude oil production in U.S. in 2018.[2,3] Oil and gas production has been a mainstay of the state's economy for decades, supporting overall growth and the economy's diversification into other sectors.

In conjunction with the economic benefits of development, collaboration between industry, government and community stakeholders has resulted in effective regulation and improved environmental impacts for development. Between 2011 and 2017, the state saw an almost 50 percent reduction in volatile organic compound (VOC) emissions even as production rose fourfold.[33] Further, operators have worked with regulatory authorities to cut 60,000 tons of methane emissions a year from operations.[33]

That same collaboration also ensures that public safety is top of mind, which is especially import as much of the development on the Front Range happens near communities. In 2018, the industry worked with government agencies and environmental groups to reach an agreement on school setbacks to keep students safe.[34] The Colorado oil and gas industry has proven that robust production and public safety can and should go hand-in-hand.[34]

Colorado consumers will be hit hard by a ban on hydraulic fracturing, paying an additional $520 per capita for goods and services in 2021 compared to today and increasing to $2,006 per capita in 2025. Cumulatively, Colorado consumers will pay an astounding $6,490 more than today through 2025.

Based on our analysis, we find that hundreds of thousands of jobs would be displaced under a scenario in which a hydraulic fracturing was banned. Table 12 summarizes these findings, which project a total job loss of 468,000 for Colorado between 2021-2025.

As we have seen in other states, the upward pressure on energy prices spurred on by implementing a hydraulic fracturing ban is reflected in lower economic output across all major economic sectors in the state. In the case of Colorado, our modeling, outlined in Table 13, finds that banning hydraulic fracturing would deprive Colorado's economy of $187 billion in state GDP by 2025, with half of that total coming directly from the upstream oil and gas segment itself.

Colorado households would also see reduced household income due to job losses and lower wages. From Table 14, our analysis finds that Colorado household income would decline by $120 billion by 2025 – $120 billion that Colorado families would otherwise be able to spend and save.

The next two tables show the local, state and federal tax revenues that would be lost from a hydraulic fracturing ban in Colorado. By 2025, with a hydraulic fracturing ban there would be $14.9 billion less in state and local tax revenues and $28 billion less in Federal tax receipts.

Table 12: Colorado Jobs Impacts from Hydraulic Fracturing Ban (thousands)

Type of Economic Shock	2021	2022	2023	2024	2025
Due to higher residential energy costs	-45	-79	-119	-145	-173
Due to higher business energy costs	-51	-90	-141	-172	-206
Upstream production losses	-74	-119	-148	-178	-200
Windfall profits	68	87	96	103	111
Total Colorado employment impacts	**-102**	**-202**	**-312**	**-391**	**-468**

Table 13: Colorado GDP Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-4	-8	-11	-13	-16	-52
Due to higher business energy costs	-6	-10	-16	-19	-23	-74
Upstream production losses	-11	-17	-21	-26	-29	-104
Windfall profits	6	8	9	9	10	42
Total Colorado GDP impacts	**-14**	**-27**	**-39**	**-49**	**-58**	**-187**

Table 14: Colorado Household Income Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-2	-4	-6	-7	-10	-29
Due to higher business energy costs	-3	-5	-8	-10	-12	-38
Upstream production losses	-8	-12	-15	-18	-21	-74
Windfall profits	3	4	5	5	6	23
Total Colorado household income impacts	**-10**	**-18**	**-25**	**-31**	**-36**	**-120**

Table 15: Colorado State and Local Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-336	-584	-883	-1,068	-1,280	-4,150
Due to higher business energy costs	-447	-801	-1,249	-1,527	-1,843	-5,867
Upstream production losses	-847	-1,365	-1,697	-2,031	-2,275	-8,214
Windfall profits	486	620	689	733	791	3,319
Total Colorado tax revenues impacts	**-1,144**	**-2,130**	**-3,140**	**-3,892**	**-4,606**	**-14,913**

Table 16: Colorado Federal Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-633	-1,098	-1,660	-2,008	-2,408	-7,808
Due to higher business energy costs	-841	-1,507	-2,350	-2,872	-3,468	-11,038
Upstream production losses	-1,593	-2,568	-3,193	-3,820	-4,279	-15,454
Windfall profits	915	1,166	1,296	1,379	1,489	6,244
Total Colorado tax revenues impacts	**-2,153**	**-4,007**	**-5,907**	**-7,322**	**-8,666**	**-28,055**

Texas

KEY FINDINGS (BY 2025)

- Job Impacts (in 2025): **-3.2 million**
- GDP Impacts: **-$1.5 Trillion**
- Household Income Impacts: **-$794 Billion**
- State and Local Tax Revenues Impacts: **-$106.6 Billion**
- Federal Tax Revenues Impacts: **-$263.4 Billion**
- Cost-of-Living Increase (per capita): **$7,280**

Texas is the leading U.S. producer of both crude oil and natural gas. In 2018, the state accounted for more than 40 percent of the nation's crude oil production[2] and 22 percent of its natural gas production.[3] Due in part to abundant energy resources, Texas has become the second-largest population and economy in the nation after California, with 13.3 million workers adding $1.78 trillion in GDP.[35] These resources are also driving billions of dollars in investment for manufacturing and export projects across the state. Texas has an unemployment rate of 3.9 percent, which is same as the national average of 3.9 percent in 2018.[5]

The state has two-fifths of the U.S. crude oil proved reserves[28] and production, which is more than any other state and exceeds all the federal offshore producing areas. Texas accounts for more than one-fourth of the nation's 100 largest oil fields by reserves, most in the Permian Basin of West Texas and in the south-central part of the state.[32] Crude oil production increased quickly after 2010 mainly because of hydraulically fractured horizontal wells drilled in both the Permian Basin in western Texas and the Eagle Ford shale in southern and eastern Texas.[36]

Growth in oil and natural gas production from shale has spurred billions of dollars in investment across the Texas economy, from manufacturing to infrastructure. Citing record natural gas production from the state's shale regions as a cheap, abundant source of feedstock, the petrochemical sector alone announced $69 billion in investments in Texas between 2010 and the beginning of 2018.[37] More recently, several multi-billion dollar petrochemical projects have started construction in Texas, such as the $10 billion Gulf Coast Growth Ventures project near Corpus Christi, Texas,[38] and LyondellBasell's $2.4 billion expansion projects at its Bayport and Channelview complexes.[39]

In addition to petrochemical manufacturing, oil and natural gas production from Texas shale development is driving investment in energy exports. In November 2019, regulators approved permits for four liquefied natural gas export projects in South Texas, which represent a combined $45 billion in investment.[40]

These projects are expected to bring thousands of jobs to the South Texas region, largely benefiting local communities. In Brownsville, Texas, where three of the planned LNG export projects are sited, the median income is about $35,000.[41] One of the projects alone – Annova LNG – is estimated to provide $324 million in direct labor income during the projects construction, while permanent jobs at the facility will have an average base wage of about double the city's median income.[42]

The Texas oil and natural gas industry remains a major force in Texas' prosperity and provides significant funding for government statewide. In fiscal year 2018, the industry paid over $14 billion in the state taxes and contributed $463 billion to the state economy.[43] Economists estimate

that oil and natural gas represents 29 percent of Texas' GDP.[44]

Put another way, if Texas were its own country, it would be the world's No.3 oil producer, behind only Russia and Saudi Arabia.[45] A scenario in which hydraulic fracturing technology is banned across the country would have a disproportionately negative impact on the place where it used with the greatest frequency.

Texas consumers will be hit hard by a ban on hydraulic fracturing, paying an additional $613 per capita for goods and services in 2021 compared to today and increasing to $2,247 per capita in 2025. Cumulatively, Texas consumers will pay an astounding $7,280 more than today through 2025.

As Table 17 shows, the state of Texas would face the possibility of losing nearly 3.2 million jobs by the time we reached 2025, after shedding more than 656,000 jobs in the first year of the ban's implementation alone.

If hydraulic fracturing was banned, our modeling points to a potential state GDP loss of $1.5 trillion billion by the year 2025 (Table 18). This total is driven in large part by the enormous cost increases that Texas businesses would be forced to endure to pay for the energy they consume.

This loss in state GDP manifests itself in several ways, including a decrease in household income for Texas residents that we estimate will be in excess of $794 billion by 2025 as outlined in Table 19. Texas would see some increase in windfall profits from its conventional production, but its losses to upstream production and higher energy costs quickly overcome any positive impacts. For Texas, most of the economic harm would come from upstream production losses followed by higher business costs.

If hydraulic fracturing were banned, Texas would receive $8.6 billion less in state and local tax revenue in 2021 and $33.0 billion less in 2025. By 2025, Texas would receive $106.6 billion less in state and tax revenue, while Federal tax collections would decline by $236.3.5 billion by 2025.

Table 17: Texas Jobs Impacts from Hydraulic Fracturing Ban (thousands)

Type of Economic Shock	2021	2022	2023	2024	2025
Due to higher residential energy costs	-264	-446	-656	-800	-966
Due to higher business energy costs	-425	-713	-1,035	-1,282	-1,568
Upstream production losses	-590	-956	-1,201	-1,447	-1,637
Windfall profits	623	794	882	939	1,014
Total Texas employment impacts	**-656**	**-1,321**	**-2,011**	**-2,590**	**-3,157**

Table 18: Texas GDP Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-24	-41	-60	-73	-88	-286
Due to higher business energy costs	-56	-92	-131	-164	-203	-646
Upstream production losses	-98	-158	-198	-238	-269	-961
Windfall profits	54	69	77	82	88	370
Total Texas GDP impacts	**-124**	**-222**	**-313**	**-394**	**-472**	**-1,525**

Table 19: Texas Household Income Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-14	-23	-35	-41	-50	-163
Due to higher business energy costs	-29	-48	-67	-84	-104	-332
Upstream production losses	-51	-83	-105	-126	-143	-508
Windfall profits	31	39	44	46	50	210
Total Texas household income impacts	**-63**	**-115**	**-163**	**-206**	**-247**	**-794**

Table 20: Texas State and Local Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-1,686	-2,846	-4,190	-5,102	-6,157	-19,982
Due to higher business energy costs	-3,934	-6,472	-9,182	-11,485	-14,198	-45,272
Upstream production losses	-6,840	-11,067	-13,872	-16,683	-18,827	-67,289
Windfall profits	3,795	4,835	5,372	5,717	6,174	25,894
Total Texas tax revenues impacts	**-8,665**	**-15,550**	**-21,872**	**-27,553**	**-33,008**	**-106,648**

Table 21: Texas Federal Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-4,163	-7,028	-10,350	-12,601	-15,206	-49,347
Due to higher business energy costs	-9,717	-15,984	-22,677	-28,364	-35,064	-111,806
Upstream production losses	-16,892	-27,332	-34,258	-41,202	-46,496	-166,180
Windfall profits	9,373	11,941	13,268	14,120	15,248	63,949
Total Texas tax revenues impacts	**-21,399**	**-38,403**	**-54,017**	**-68,047**	**-81,518**	**-263,384**

New Mexico

KEY FINDINGS (BY 2025)

- Job Impacts (in 2025): **-142,000**
- GDP Impacts: **-$86 Billion**
- Household Income Impacts: **-$26 Billion**
- State and Local Tax Revenues Impacts: **-$8 Billion**
- Federal Tax Revenues Impacts: **-$8.3 Billion**
- Cost-of-Living Increase (per capita): **$5,790**

New Mexico is one of the great success stories of America's energy revolution. A state hard hit by the Great Recession, historic levels of oil and natural gas production – made possible by advancements and improvements in hydraulic fracturing technology – have resulted in new job creation, economic growth, and increases in personal income that are leading the nation.

New Mexico was the ninth-largest state in total energy production in 2017, primarily because of its crude oil, natural gas, and coal production.[46] It holds more than six percent of the total proved crude oil reserves in the United States.[47]

New Mexico's prominent contribution to the combined national and global benefits of energy production will likely continue to grow because of hydraulic fracturing. In 2018, it became the fourth-largest oil producing state, producing 249 million barrels of crude oil, which accounts for six percent of the nation's crude oil production.[48] Data from the state's Oil Conservation Division show that 237 million barrels of oil were produced January-September, which is 35 percent higher than this point last year and puts New Mexico's annual production on pace to reach 300 million barrels for the first time ever.[49]

New Mexico also has more than four percent of the nation's total proved natural gas reserves[31] and the state produced 1.36 trillion cubic feet of natural gas, accounting for 4.4 percent of U.S. natural gas production.[3] This was an increase of 25 percent from 2013 when New Mexico produced 1.08 trillion cubic feet of natural gas.[49]

New Mexico's natural gas production from shale gas wells accounted for 64 percent of state production in 2018.[51] Natural gas production in New Mexico exceed its consumption, and exports through interstate pipelines are more than 2.5 times that of imports.[50]

In 2018, New Mexico generated $99.4 billion in GDP, had nearly 900,000 people in the workforce and an unemployment rate of 4.9 percent, and a median household income of $48,283.[51] This represents significant gains compared to 2013 when the GDP was $88.4 billion,[52] there were 863,000 people in the workforce, unemployment stood at 6.9 percent,[53] and the median income was $43,368.[51]

The bulk of those gains can be attributed to the recent boom in oil and natural gas production stemming from hydraulic fracturing. This analysis shows that a ban on hydraulic fracturing in New Mexico would result in the loss of 142,000 jobs - representing 15.8 percent of the state workforce - and wipe out $86 billion in cumulative GDP from the state's economy through 2025. Further, New Mexicans would lose out on $26 billion in household income (an average of $10,723 per household in 2025).

New Mexico consumers will be hit hard by a ban on hydraulic fracturing, paying an additional $485 per capita for goods and services in 2021 compared to today and increasing to $1,787 per capita in 2025. Cumulatively, New Mexico

consumers will pay an astounding $5,790 more than today through 2025.

The energy industry, especially oil and natural gas, makes a significant contribution to the state budget. Revenue from oil and gas development make up more than one-third of New Mexico's general fund, the primary source of state funding for government and public expenses. Additionally, the industry accounts for more than $1 billion annually for education in New Mexico.[52]

As summarized in Table 22, New Mexico would generate $8.0 billion less in cumulative state and local tax revenues through 2025 if hydraulic fracturing was banned. Federal tax receipts would decline by $8.3 billion in total over the same period.

Oil and natural gas development are critical to New Mexico's economy, with the industry serving as a strong driver of job growth for the state. New Mexico added 20,100 jobs between September 2018 and September 2019, with jobs in mining and construction – which includes the oil and natural gas industry – accounting for more than one-third of the new jobs.[53]

Table 24 summarizes these impacts, showing 27,000 jobs would be lost in 2021, culminating in 2025 with the loss of 142,000 jobs. To put this potential loss in perspective, more jobs supported by the oil and natural gas industry would be lost in the first year of a hydraulic fracturing ban than the total number of jobs that all New Mexico industries created in the last year.

Oil and natural gas development added $10.7 billion to New Mexico's economy in 2017, making it the state's top industry in terms of economic impact that year. Excluding the state and federal governments contribution, this made it the state's top industry in terms of economic impact.[54] It has also been the leading contributor to real economic growth in the state and made New Mexico a national leader in this area.[55]

If hydraulic fracturing were banned, state GDP would decline considerably. As Table 25 shows, the state would lose $86 billion in state GDP by 2025 if unconventional development comes to an end as a result of a hydraulic fracturing ban.

As shown in Table 26, a ban on hydraulic fracturing would force New Mexico households to lose $26 billion in total income by 2025..

On a household basis, the impact is significant. In 2025, the average household in New Mexico would lose $10,723 in labor income because of the ban on hydraulic fracturing (based on U.S. Census data of 770,435 households). This is from a combination of upstream production losses and higher energy costs counterbalanced by the windfall profits.

Table 22: New Mexico State and Local Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-110	-185	-274	-333	-402	-1,304
Due to higher business energy costs	-171	-292	-435	-538	-657	-2,093
Upstream production losses	-607	-984	-1,238	-1,493	-1,690	-6,012
Windfall profits	207	264	293	312	337	1,411
Total New Mexico tax revenues impacts	**-681**	**-1,198**	**-1,654**	**-2,052**	**-2,412**	**-7,997**

Table 23: New Mexico Federal Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-113	-192	-283	-344	-415	-1,348
Due to higher business energy costs	-177	-302	-450	-556	-679	-2,164
Upstream production losses	-627	-1,017	-1,280	-1,543	-1,747	-6,215
Windfall profits	214	272	303	322	348	1,459
Total New Mexico tax revenues impacts	**-704**	**-1,239**	**-1,710**	**-2,121**	**-2,494**	**-8,268**

Table 24: New Mexico Jobs Impacts from Hydraulic Fracturing Ban (thousands)

Type of Economic Shock	2021	2022	2023	2024	2025
Due to higher residential energy costs	-15	-25	-37	-45	-53
Due to higher business energy costs	-16	-27	-41	-51	-61
Upstream production losses	-27	-43	-55	-66	-75
Windfall profits	30	38	42	45	48
Total New Mexico employment impacts	**-27**	**-58**	**-91**	**-117**	**-142**

Table 25: New Mexico GDP Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-1	-2	-3	-3	-5	-14
Due to higher business energy costs	-2	-3	-5	-6	-7	-23
Upstream production losses	-7	-11	-13	-16	-18	-65
Windfall profits	2	3	3	3	4	15
Total New Mexico GDP impacts	**-7**	**-13**	**-18**	**-22**	**-26**	**-86**

Table 26: New Mexico Household Income Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	0	-2	-2	-2	-2	-8
Due to higher business energy costs	-1	-1	-2	-3	-3	-10
Upstream production losses	-2	-3	-3	-4	-5	-17
Windfall profits	1	2	2	2	2	9
Total New Mexico household income impacts	**-2**	**-4**	**-5**	**-7**	**-8**	**-26**

Wisconsin

KEY FINDINGS (BY 2025)

- Job Impacts (in 2025): **-300,000**
- GDP Impacts: **-$93 Billion**
- Household Income Impacts: **-$51 Billion**
- State and Local Tax Revenues Impacts: **-$8.3 Billion**
- Federal Tax Revenues Impacts: **-$15.9 Billion**
- Cost-of-Living Increase (per capita): **$4,777**

Wisconsin generated $337 billion in GDP in 2018,[56] had 3.04 million workers and an unemployment rate of 3 percent, which is lower than the national average of 3.9 percent and almost the lowest rate in U.S.[5] Much like Michigan, the importance of shale development to Wisconsin is not due to energy production in the state, but rather due to the important role that oil and natural gas consumption and supply play in powering the state's economy.

Wisconsin is the eleventh largest state in the nation for manufacturing GDP, with the manufacturing sector accounting for nearly 20 percent of the state's GDP.[56] By end-use, the industrial sector makes up the largest portion of Wisconsin's overall energy consumption, accounting for about one-third of the total in 2017.[56]

Agriculture and the energy intensive manufacturing of food and beverage products are also key drivers of industrial energy consumption in Wisconsin.[57] Agriculture contributes about $105 billion annually to the Wisconsin economy, accounting for nearly 12 percent of the state's employment.[58] Natural gas-derived fertilizers play a large role in sustaining the state's agricultural output, helping to grow the state's crops and feed livestock.[57] Additionally, agriculture in Wisconsin relies heavily on diesel to power farm equipment, with the fuel accounting for about 55 percent of total energy consumption in the state's agricultural sector.[59] Considering Wisconsin is home to nearly 65,000 farms sitting on about 14.3 million acres, the sector's reliance on and consumption of diesel and natural gas-derived fertilizer is significant.[58]

Natural gas is also vital to manufacturing in Wisconsin. Manufacturing represents over 18 percent of the state's economic output and employing 16 percent of the workforce.[60] To power this energy intensive sector, manufacturers in Wisconsin turn to natural gas, which accounts for over 51 percent of industrial fuel consumption.[58]

Wisconsin does not have any oil and natural gas reserves or production and relies on other states to meet its energy needs. Natural gas demand is met by several interstate pipelines from Oklahoma, Texas, Louisiana, Kansas, and Alberta, Canada. Additionally, the state consumes 22 million tons of coal per year to generate electricity, which arrives by rail from Wyoming.[61]

Wisconsin has only one small oil refinery and it receives a major portion of its crude oil supply from North Dakota, another state that is now producing vast amounts of oil due to hydraulic fracturing.[62] Crude oil arrives at the Wisconsin refinery from Canada and North Dakota via railcar and a major crude oil pipeline.[63]

Wisconsin has abundant resources of sand that have been mined for the petroleum industry

more than 100 years. Wisconsin is by far the largest producer of industrial sand in the nation, a market-driven by sand used in the hydraulic fracturing process. High quality sand mined in southwestern Wisconsin is sought after for enhanced recovery in the hydraulic fracturing of oil and gas formations.[64]

Over the last decade, with the rise of shale oil, the frac sand industry has flourished to create jobs and economic opportunity, particularly in western Wisconsin and southeastern Minnesota. The Wisconsin Industrial Sand Association states that "companies involved in Wisconsin's sand mining industry employ thousands in family-supporting jobs and are making significant, multimillion-dollar investments in areas across Wisconsin, generating hundreds of millions of dollars in overall economic impact to the state and in local communities."[65]

Wisconsin consumers will be hit hard by a ban on hydraulic fracturing, paying an additional $440 per capita for goods and services in 2021 compared to today and increasing to $1,436 per capita in 2025. Cumulatively, Wisconsin consumers will pay an astounding $4,777 more than today through 2025.

Table 27 summarizes the volume of jobs that would be lost as a result of a hydraulic fracturing ban. All told, we find that nearly 300,000 jobs would be lost in Wisconsin in 2025.

Our modeling indicates that $93 billion in state GDP in Wisconsin would be lost by 2025, with most of those losses attributed to the higher costs for energy. Table 28 summaries the impacts that would be felt starting in 2021 and going on through 2025. All of these losses in state GDP translate into lost income for Wisconsin households, with residents losing more of their hard-earned money as each year passes and increase the cost of energy consumption.

If a ban were implemented in 2021, our analysis finds that Wisconsin households would experience a $51 billion reduction in income by 2025 (Table 29), and an almost $8.7 billion reduction in state and local tax revenue by 2025 (Table 30). The Federal government would generate $15.9 billion less in tax revenue over the same period as shown in Table 31.

Table 27: Wisconsin Jobs Impacts from Hydraulic Fracturing Ban (thousands)

Type of Economic Shock	2021	2022	2023	2024	2025
Due to higher residential energy costs	-40	-66	-93	-113	-137
Due to higher business energy costs	-49	-89	-139	-168	-201
Upstream production losses	0	0	0	0	0
Windfall profits	23	30	33	35	38
Total Wisconsin employment impacts	**-66**	**-125**	**-199**	**-246**	**-300**

Table 28: Wisconsin GDP Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-3	-6	-8	-10	-12	-39
Due to higher business energy costs	-5	-9	-15	-18	-21	-68
Upstream production losses	0	0	0	0	0	0
Windfall profits	2	3	3	3	3	14
Total Wisconsin GDP impacts	**-6**	**-12**	**-20**	**-25**	**-30**	**-93**

Table 29: Wisconsin Household Income Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-2	-4	-5	-6	-7	-24
Due to higher business energy costs	-3	-5	-8	-9	-11	-36
Upstream production losses	0	0	0	0	0	0
Windfall profits	1	2	2	2	2	9
Total Wisconsin household income impacts	**-4**	**-7**	**-11**	**-13**	**-16**	**-51**

Table 30: Wisconsin State and Local Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-318	-517	-733	-893	-1,079	-3,540
Due to higher business energy costs	-444	-816	-1,302	-1,578	-1,889	-6,029
Upstream production losses	0	0	-1	-1	-1	-3
Windfall profits	190	242	269	286	309	1,295
Total Wisconsin tax revenues impacts	**-572**	**-1,091**	**-1,767**	**-2,186**	**-2,660**	**-8,276**

Table 31: Wisconsin Federal Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-611	-993	-1,410	-1,717	-2,075	-6,805
Due to higher business energy costs	-853	-1,569	-2,503	-3,034	-3,632	-11,591
Upstream production losses	0	-1	-1	-1	-1	-5
Windfall profits	365	465	517	550	594	2,490
Total Wisconsin tax revenues impacts	**-1,099**	**-2,098**	**-3,397**	**-4,202**	**-5,115**	**-15,911**

Michigan

KEY FINDINGS (BY 2025)

- Job Impacts (in 2025): **-516,000**
- GDP Impacts: **-$159 Billion**
- Household Income Impacts: **-$88 Billion**
- State and Local Tax Revenues Impacts: **-$13.5 Billion**
- Federal Tax Revenues Impacts: **-$26.4 Billion**
- Cost-of-Living Increase (per capita): **$5,170**

In 2018, Michigan generated $528 million in GDP,[66] had 4.7 million employed workers, and had an unemployment rate of 4.1 percent, which is higher than the national average of 3.9 percent.[4] The manufacturing sector is a very important part of the Michigan economy, accounting for nearly 20 percent of the state's GDP and ranking sixth in the nation.[66] So while the state might not be a major producer of oil and natural gas, home heating and energy intensive manufacturing in the state – particularly in the automotive sector – make these resources vital to Michigan's overall economic health.

Michigan's crude oil reserves and production account for less than 0.15 percent of the nation's total,[2] and natural gas reserves and production are all lower than 0.3 percent of the U.S.[3] The Antrim Gas Field in Michigan's Lower Peninsula is one of the nation's top 100 natural gas fields ranked by proved reserves.[32] Michigan has the largest underground natural gas storage capacity in the nation at nearly 1.1 trillion cubic feet, more than one-ninth of the U.S. total.[67]

Michigan's natural gas production and oil has declined over the past decades. In 2018, gross withdrawals of natural gas were less than 30 percent of the state's 1997 peak.[68] At the same time, oil production declined from a peak of about 35 million barrels per year in 1981 to less than 5.5 million barrels in 2018.[69] Still, according to a study commissioned by the Michigan Oil and Gas Association, Michigan's oil and natural gas industry creates tens of thousands of jobs and billions of dollars in income for Michigan residents.[70]

The significance of oil and natural gas in Michigan, however, is primarily in the roles these resources play in manufacturing. The manufacturing of transportation equipment accounts for almost half of the state's manufacturing gross domestic product, which totaled over $102 billion in 2018, sixth-largest in the country.[46] In total, Michigan's manufacturing sector accounts for over 14 percent of state employment.[71]

Synonymous with the automotive industry, it's no surprise that motor vehicles and vehicle parts make up the majority of Michigan's manufacturing output.[71] Michigan is home to 96 of the top 100 automotive suppliers in North America[72] and accounts for 17 percent of U.S. automotive production.[73] Further, $12 billion in automotive research and development spent in the state annually.[72]

Production of these vehicles and their parts at such as scale is an extremely energy intensive process. Industrial energy consumption accounts for over a quarter of the state's total consumption,[74] with the sector representing 20 percent of Michigan's overall natural gas use in 2017.[75] Used for heating, power generation and

as a feedstock, natural gas has continued to play an important role in state manufacturing. In fact, natural gas consumption in Michigan's industrial sector growing 25 percent between 2008 and 2018.[76] A ban on hydraulic fracturing would therefore cripple the Michigan manufacturing, driving up energy and natural gas costs.

Unsurprisingly, due to the importance of manufacturing and the state's colder climate, Michigan is among the top states in the nation in total energy consumption.[66] In 2018, Michigan's total natural gas consumption was almost ten times greater than the state's natural gas production.[77]

At the residential level, more than three-fourths of Michigan households use natural gas as their primary source for home heating, which is the largest natural gas consumer in the state.[78] The state is also a top consumer of propane – derived from petroleum – with Michigan being the largest residential consumer of hydrocarbon gas liquids in the United States.[66] Crude oil consumption in Michigan is greater than 80 percent of the states and is one of the top five states in residential petroleum use (heating oil and propane).[79]

In a scenario where hydraulic fracturing were banned, we find that nearly 516,000 jobs would be lost in Michigan in 2025 (Table 32). If the ban takes effect in 2021, our modeling indicates that $51 billion in state GDP in Michigan would be lost, with most of those losses attributed to the higher costs for energy.

Michigan consumers will be hit hard by a ban on hydraulic fracturing, paying an additional $442 per capita for goods and services in 2021 compared to today and increasing to $1,575 per capita in 2025. Cumulatively, Michigan consumers will pay an astounding $5,170 more than today through 2025. Table 33 summaries the impacts that would be felt starting 2021 and going on through 2025.

As we discussed above, Michigan is one of the top energy-consuming states in the United States. The ban would cause high energy costs that would affect both residents and businesses. Our analysis finds that Michigan households would experience an $88 billion reduction in income by 2025 (Table 34) and that the state would experience a nearly $13.5 billion reduction in state and local tax revenue by 2025 (Table 35). Federal receipts would be $26.4 billion less by 2025.

Table 32: Michigan Jobs Impacts from Hydraulic Fracturing Ban (thousands)

Type of Economic Shock	2021	2022	2023	2024	2025
Due to higher residential energy costs	-71	-119	-175	-211	-252
Due to higher business energy costs	-78	-142	-224	-271	-324
Upstream production losses	-3	-4	-6	-7	-8
Windfall profits	42	53	59	63	68
Total Michigan employment impacts	**-109**	**-212**	**-345**	**-426**	**-516**

Table 33: Michigan GDP Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs and windfall profits	-6	-11	-15	-19	-22	-73
Due to higher business energy costs	-8	-15	-24	-29	-35	-111
Upstream production losses	0	0	0	-1	-1	-2
Windfall profits	4	5	5	6	6	26
Total Michigan GDP impacts	**-11**	**-21**	**-34**	**-42**	**-51**	**-159**

Table 34: Michigan Household Income Impacts from Hydraulic Fracturing Ban (2018 $ billions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs	-3	-6	-9	-10	-12	-40
Due to higher business energy costs	-5	-8	-13	-16	-19	-61
Upstream production losses	0	0	0	0	0	0
Windfall profits	2	3	3	3	3	14
Total Michigan household income impacts	**-6**	**-12**	**-19**	**-23**	**-28**	**-88**

Table 35: Michigan State and Local Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs and windfall profits	-518	-872	-1,281	-1,546	-1,850	-6,067
Due to higher business energy costs	-687	-1,268	-2,031	-2,462	-2,948	-9,395
Upstream production losses	-16	-26	-35	-43	-50	-170
Windfall profits	316	403	448	477	515	2,159
Total Michigan tax revenues impacts	**-905**	**-1,763**	**-2,899**	**-3,574**	**-4,333**	**-13,473**

Table 36: Michigan Federal Tax Revenues Impacts from Hydraulic Fracturing Ban (2018 $ millions)

Type of Economic Shock	2021	2022	2023	2024	2025	Cumulative
Due to higher residential energy costs and windfall profits	-1,015	-1,708	-2,510	-3,028	-3,624	-11,885
Due to higher business energy costs	-1,346	-2,484	-3,978	-4,823	-5,774	-18,405
Upstream production losses	-31	-52	-68	-84	-98	-332
Windfall profits	620	790	877	934	1,008	4,229
Total Michigan tax revenues impacts	**-1,772**	**-3,454**	**-5,678**	**-7,001**	**-8,489**	**-26,394**

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CHAPTER 5

IMPACTS ON MANUFACTURING SECTOR

PETROCHEMICALS IN TEXAS

Texas employs more workers in the petrochemical manufacturing sector than any other state, accounting for over 65 percent of the industry's workforce. In 2017, it contributed nearly $21 billion to Texas and U.S. GDP, with wages averaging over $170,000 per employee.

The petrochemical manufacturing section also stands to be one of the hardest hit if a ban on hydraulic fracturing in implemented, as it uses vast hydrocarbons as direct inputs to make chemicals and plastics. Our analysis shows that the Texas petrochemical manufacturing sector would suffer greatly– shedding over 1,800 jobs, $316 million in wages, $2.1 billion in GDP, and $522 million in tax revenues directly in 2025, as shown in Table 1.

Furthermore, because of the great importance of the petrochemical industry to other industries, the total impact to the to the Texas petrochemical industry (direct, indirect, and induced) are far larger. In 2025, the reduction in employment measures 48,000, with over $8.8 billion in GDP, $3.7 billion in household income, and $2.1 billion in tax revenue lost.

Table 1: Texas Petrochemical Industry Direct Impacts from Hydraulic Fracturing Ban

	2021	2022	2023	2024	2025
Employment (thousands)	-0.6	-0.9	-1.1	-1.5	-1.8
GDP ($ millions)	-677	-1,036	-1,326	-1,708	-2,149
Household income ($ millions)	-100	-153	-195	-251	-316
State, local, & federal tax revenues ($ millions)	-164	-251	-322	-415	-522

Table 2: Texas Petrochemical Industry Total Impacts from Hydraulic Fracturing Ban

	2021	2022	2023	2024	2025
Employment (thousands)	-17	-25	-29	-38	-48
GDP ($ millions)	-3,132	-4,479	-5,293	-6,885	-8,820
Household income ($ millions)	-1,313	-1,876	-2,215	-2,881	-3,692
State, local, & federal tax revenues ($ millions)	-760	-1,088	-1,285	-1,672	-2,141

PAPER MILLS IN WISCONSIN

In 2017, the paper mill industry in Wisconsin employed approximately 10,500 people. The industry contributed $8.0 billion in sales output, $1.8 billion in GDP, and $940 million in labor income to the Wisconsin economy. Paper mills are just one subsector of the iconic forestry and wood products value chain in Wisconsin, and Wisconsin has more employment in paper milling than any other state.

While the impacts of a hydraulic fracturing ban may initially seem distant from the paper mill industry, the fact is there are very direct impacts to the industry. Paper mills are energy-intensive. They need energy to operate equipment and for lighting. Additionally, they need oil and gas for creating process heat.[1] Some plants rely on natural gas to operate combined heat-and-power cogeneration facilities to maximize efficiency.[2]

A ban on hydraulic fracturing also would have indirect impacts on Wisconsin's paper mills. Higher direct costs from the ban would reduce consumer spending on goods and services from other sectors. For example, households and schools would reduce their consumption on paper-based school supplies and would printing paper because of higher direct energy costs.

Table 3 and Table 4 show the direct and total impacts for Wisconsin paper mills from the ban. Table 3 shows the direct impact of higher energy prices alone on the sector. Table 4 shows the effects including the reduction in demand from households and other sectors, which has a much larger total impact on Wisconsin's paper mills. By 2025, the 4,800 jobs lost due to a hydraulic fracturing ban is approximately 45% of the sector's employment in the state.

The effects of a hydraulic fracturing ban would be so sweeping and widespread across the U.S. economy that no industry or region of the country would not feel its influence. The impacts to the Wisconsin paper mill industry from a ban provide a very clear example of this ripple effect.

Table 3: Wisconsin Paper Mills Sector, Direct Impacts from Hydraulic Fracturing Ban

STATISTIC	2021	2022	2023	2024	2025
Employment (thousands)	-0.1	-0.3	-0.4	-0.5	-0.6
GDP ($ millions)	-$25	-$46	-$75	-$91	-$109
Household income ($ millions)	-$13	-$24	-$39	-$47	-$56
State, local, and federal tax revenues ($ millions)	-$12	-$23	-$36	-$44	-$53

Table 4: Wisconsin Paper Mills Sector, Total Impacts from Hydraulic Fracturing Ban

STATISTIC	2021	2022	2023	2024	2025
Employment (thousands)	-1.1	-2.0	-3.3	-4.0	-4.8
GDP ($ millions)	-$123	-$232	-$373	-$456	-$545
Household income ($ millions)	-$73	-$137	-$221	-$270	-$324
State, local, and federal tax revenues ($ millions)	-$50	-$94	-$152	-$185	-$222

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