



the state of
**American
Energy**





About the American Petroleum Institute (API):

API is a national trade association that represents all segments of America's technology-driven oil and natural gas industry. Its more than 500 members—including large integrated companies, exploration and production, refining, marketing, pipeline, marine businesses, and service and supply firms—provide most of the nation's energy. The industry also supports 9.2 million U.S. jobs and 7.3 percent of the U.S. economy, delivers \$86 million a day in revenue to our government, and, since 2000, has invested over \$2 trillion in U.S. capital projects to advance all forms of energy, including alternatives.



Message from the President and CEO

Each year, the State of American Energy provides the oil and natural gas industry's perspective on the vital issues surrounding our country's energy policy.

As the 113th Congress convenes, and as President Obama begins his second term in office, the industry is well positioned to fuel a stronger economy. Policymakers have an opportunity to ensure continued economic growth by taking greater advantage of domestic oil and natural gas, our world-class refineries and the infrastructure in place to get these valuable products to the American consumer.

The industry can put millions back to work, produce the fuels we need, provide billions in revenue to the government and improve our energy security for generations to come with investments in development of America's energy resources.

With these goals in mind, API and its members are committed to working with policymakers to take advantage of the enormous opportunities available through the safe and responsible production and refining of our nation's oil and natural gas resources. We look forward to yet another productive and successful year.

A handwritten signature in black ink that reads "Jack Gerard". The signature is fluid and cursive, with a long horizontal stroke at the end.

Jack N. Gerard
President and CEO
API

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Overview:
Investing in America

Overview: Investing in America

America runs on energy. Every moment of every day, energy is required for Americans to maintain their daily lives, and the majority of that energy is supplied by oil and natural gas.

Oil and natural gas are integral to all aspects of the U.S. economy—and America's economic recovery—as the success of any modern economy is dependent on reliable and affordable energy. Over the last 100 years, and well into the foreseeable future, oil and natural gas have and will continue to provide the energy America needs to succeed.

Without oil and natural gas, Americans' lives would be far different, making it exceedingly challenging for families to heat their homes and run their daily lives. The industry provides the building blocks required for life-saving medicines, pain-relievers and artificial heart valves as well as everyday products such as shampoo and clothing, and contributes significantly to farming and other industries.

As the United States looks to return to solid economic footing, the oil and natural gas industry is spurring economic growth through hundreds of billions of dollars in investments each year, thereby creating jobs and advanced technologies across a wide range of sectors, while ensuring the industry remains a safe and responsible environmental steward. This investment also supports local communities and raises the standard of living for Americans, as it strengthens U.S. energy security.

Investments in unconventional resources have made oil and natural gas trapped in shale and other rock formations accessible through horizontal drilling and hydraulic fracturing. The industry is expected to invest more than \$5.1 trillion in cumulative capital expenditures by 2035, adding 1.3 million new jobs by 2020 to support a total of 3 million jobs.¹ By 2035, these resources will support more than 3.5 million jobs.² Further, unconventional resources will provide \$62 billion in additional federal, state and local tax receipts in 2012 and more than \$111 billion in 2020.³ In total, ongoing industry investments will contribute more than \$2.5 trillion in cumulative added revenues to governments between 2012 and 2035.⁴

In 2011, oil and natural gas supplied 62 percent of the energy America needed and will continue to play a leading role in the U.S. energy mix for decades to come.⁵ Even as renewable energy consumption is expected to grow by more than 50 percent by 2040 and as energy efficiency improves, government projections estimate that 59 percent of U.S. energy demand will still be met by oil and natural gas in 2040.⁶

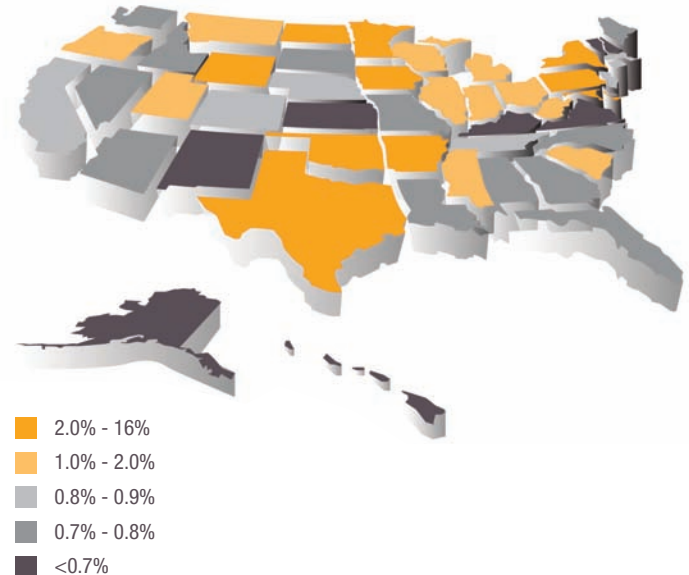
With global economic and population growth continuing to drive increased energy demand, the United States will need more domestic oil and natural gas supplies to meet future energy needs, maintain U.S. standards of living and compete in the global economy. Global energy demand is expected to rise 35 percent by 2035, while natural gas demand is expected to rise 50 percent over the same period.⁷ In the United States, energy consumption is expected to rise 7 percent by 2040, with natural gas consumption increasing by nearly 20 percent by 2040.⁸ Domestic oil and natural gas resources offer great potential to meet these demands—in fact, America could meet 100 percent of its liquid fuel needs through safe, reliable North American sources by 2024.^{9,10}

The following pages demonstrate how the oil and natural gas industry's investments in America are helping achieve U.S. economic and energy security goals—and how the industry is poised to continue these investments well into the future.

U.S. Map of Employment Growth

Growth in Next 5 Years Attributable to Upstream Technological Advances Since 2007

(Change in 2017 as Percentage of 2010 State Employment)



Source: American Clean Skies Foundation, "Tech Effect: How Innovation in Oil and Gas Exploration is Spurring the U.S. Economy," October 2012; ICF International estimates based on Tax Policy Center "State and Local General Revenue as a Percentage of Personal Income 2004-2010," October 2012; and 2010 state employment (employed population) from the U.S. Bureau of Labor Statistics, "Economic News Release," April 2012.



Investing in Jobs
and the Economy

Investing in Jobs and the Economy

Investments by the oil and natural gas industry are leading to job creation and economic growth across the United States.

These investments provided an annual stimulus to the U.S. economy, totaling \$545 billion through capital expenditures, wages and dividends in 2011 alone, creating jobs and helping provide for America's economic future.¹¹ Of that \$545 billion, \$224 billion was paid to 2.6 million U.S. employees in wages, salaries and benefits, including proprietor income.¹² Investments totaling \$292 billion went to new energy projects, improvements to existing projects and enhancements of refinery and other downstream operations, and about \$29 billion in cash dividends was distributed to shareholders.¹³

The economic benefits of domestic oil and natural gas development are keeping the United States from sliding back into another recession, according to a July 2012 Bank of America Merrill Lynch study. The study cites lower natural gas costs as the largest benefit of industry development, which saved U.S. companies and consumers an average of \$566 million a day from July 2011 to June 2012 relative to world prices, through lower manufacturing costs, heating and electric bills for consumers and businesses alike.¹⁴ Natural gas prices, which peaked at \$13.06 per thousand cubic feet in 2008, dropped to less than \$3 in 2012.¹⁵

And consumers are benefiting. Development of American natural gas is reducing average retail electricity prices by 10 percent, and will allow American households to save, on average, nearly \$1,000 per year between 2012 and 2015, giving families more disposable income.¹⁶ This number is expected to rise to more than \$2,000 in savings per household by 2035.¹⁷

Even during the recession years of 2007 through 2009, while other sectors were downsizing, jobs supported by the oil and natural gas industry remained relatively stable. In all, the oil and natural gas industry supports 9.2 million American jobs.¹⁸ Despite the challenging economic environment, the industry has and will continue to create jobs and contribute to economic growth across a variety of sectors, including manufacturing, the service industry and others, helping to stem jobs losses throughout the U.S. economy.

American Job Growth

In addition to those states that have historically benefited from industry production for decades, job growth is now occurring in areas not typically known for oil and natural gas resources. Over the past decade, more than 30 states have experienced at least a 50 percent rise in the number of workers who support oil and natural gas development directly or through suppliers and service companies.²⁰

The refining sector supports roughly 540,000 high-paying jobs with an average income of \$94,500 for refinery workers.²¹ The direct, indirect and induced jobs generated nearly \$78 billion in labor income in 2009 alone.²²

Jobs created in the oil and natural gas industry paid more than \$12,000 higher than the national average in 2011.²³ And for every direct job created in the oil, natural gas and related industries, three or more indirect and induced jobs are also generated across the U.S. economy.²⁴

These jobs cover a variety of professions, from drilling engineers extracting oil and natural gas in states like North Dakota and Texas, to machinists who create necessary manufacturing equipment in states like Ohio and Indiana, to those providing IT support in California and Virginia.

For example, the expansion of the Motiva refinery in Port Arthur, Texas, provided 6,500 construction jobs for workers in southeast Texas, along with additional work at the refinery.²⁵ The project also provided jobs nearly 2,000 miles away in Maine for more than 600 highly skilled workers, who were involved in equipment manufacturing and fabrication.²⁶

To appreciate how industry jobs impact other areas of the economy, look offshore. For each direct job offshore, the industry supports three indirect and induced jobs onshore—including the cooks, suppliers and others servicing the industry.²⁷

Restaurants, hotels, movie theaters and other businesses have also benefited from increased investment and development, as employment and wages have grown in local communities across America.

“The natural gas boom in the United States offers a tremendous opportunity to strengthen American energy security by drastically reducing our dependence on imported oil, while at the same time creating new U.S. jobs and industries.”

– Daniel Poneman
U.S. Deputy Energy Secretary
July 2012¹⁹

Economic Contributions

This impressive and encouraging job growth across the country is made possible by oil and natural gas companies' contributions to and investments in America's economy. The industry supports more than \$1 trillion in total value added to the economy, representing 7.3 percent of U.S. GDP.²⁸

Therefore, it is no surprise the industry represents five of the top-11 spots on the "Investment Heroes" list of the top-25 U.S. capital investors, in which the Progressive Policy Institute ranked non-financial U.S.-based companies by their 2011 U.S. capital spending.²⁹ According to the study, these five oil and natural gas companies invested \$32.7 billion in combined capital expenses in 2011.³⁰

In 2009, the refining sector supported nearly 2 percent of U.S. GDP, or \$268 billion to the U.S. economy.³¹ And in 2010, the offshore oil and natural gas industry's expenditures and operating expenses were more than \$25 billion.³² In 2011, total U.S. exploration and production expenditures exceeded \$250 billion.³³

Government Revenue

U.S. oil and natural gas companies pay considerably more in taxes than other manufacturing industries. In 2011, industry income tax expenses, as a share of pre-tax net income, averaged 40.6 percent, compared to 25.1 percent for other S&P industrial companies.³⁴ The rate is also significantly higher than that paid by technology, computer and peripheral firms, which had an effective tax rate of 22.9 percent in 2011.³⁵

The U.S. oil and natural gas industry also pays the federal government significant rents, royalties and lease payments for production access—totaling \$110 billion since 2000.³⁶ In fact, U.S. oil and natural gas companies pay on average more than \$86 million every single day to the federal government in both income taxes and production fees, providing an important revenue stream to fund infrastructure, education and community projects across the country.³⁷

Manufacturing Benefits

The U.S. manufacturing sector, which has experienced significant job and economic losses over the past few decades, is making a comeback thanks to reliable and affordable supplies of natural gas. This resurgence has been made possible by the increased development of energy from shale accessed by innovative technology.

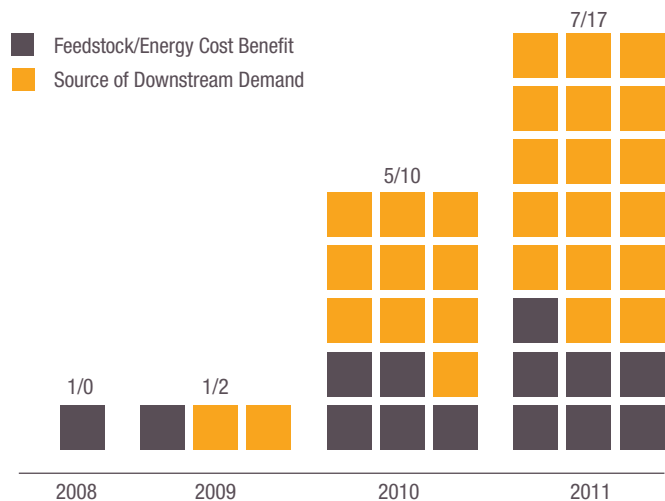
Manufacturers use approximately one-third of all the energy produced in the United States to create products like cars and home-building materials.³⁸ With lower feedstock and energy costs resulting from increasing U.S. natural gas production, more than 1 million additional American manufacturing jobs could be created by 2025, according to PricewaterhouseCoopers.³⁹

"The increasing availability of U.S. energy at low prices has made many companies rethink their strategies of locating abroad, and others to return to this country... This is having an impact on U.S. reindustrialization."

— Robert D. Hormats
U.S. Under Secretary of State for Economic Growth,
Energy and the Environment
October 2012⁴⁰

Manufacturers Reporting Benefits from Shale Gas

Number of Chemical, Metal and Industrial Manufacturers Disclosing Beneficial Impacts from Shale Gas, 2008 – 2011



Source: Company filings as reported in PricewaterhouseCoopers, "Shale Gas: A Renaissance in U.S. Manufacturing?" December 2011.

The chemical industry is particularly advantaged. According to the American Chemistry Council, a 25 percent increase in the supply of ethane—a liquid derived from shale gas—could spur more than 400,000 U.S. jobs across the economy in the chemical industry; \$4.4 billion annually in federal, state and local tax revenue; and \$16.2 billion in capital investment.⁴¹

Dow Chemical, a large user of natural gas to produce chemicals and plastics, estimates that low natural gas prices could spur more than 90 new U.S. manufacturing projects by a variety of companies.⁴² Dow estimates that these projects would create 3 million jobs and \$70 billion in potential investment—equal to the entire state budget of Florida in 2012.^{43,44}

In January 2012, Canadian-based Methanex announced that it was moving a methanol manufacturing facility from Chile to Louisiana, citing “the outlook for low North American natural-gas prices” as a key reason for the move.⁴⁵ Methanex said that the “U.S. Gulf Coast and Louisiana possess world-class infrastructure, skilled workers and a very positive environment in which to do business.”⁴⁶

Methanex is not alone. Other manufacturers are ultimately taking notice and advantage of lower prices.

Santana Textiles, a Brazilian textile company, is building a \$180 million denim facility in Edinburg, Texas, instead of Mexico, also citing low U.S. natural gas prices.⁴⁷ Orascom Construction Industries, based in Cairo, Egypt, has plans for a \$1.4 billion fertilizer plant in Iowa, while CF Industries Inc., based in Illinois, plans to spend up to \$2 billion to boost U.S. fertilizer production through 2016.⁴⁸

“I never would have expected that as a region we’d have a second chance to be a real leader in American manufacturing. Suddenly we’re back in the game.”

– Bill Flanagan
Executive Vice President
Allegheny, Pa., Conference on Community Development
October 2012⁴⁹

Canadian Oil Sands

In addition to the oil and natural gas industry’s investments in America, investments in infrastructure are needed to utilize Canadian resources to strengthen U.S. energy security and increase job and economic growth.

Canada is the United States’ strongest trading partner and is also its largest source of imported oil, thanks to its abundant and reliable oil sands. Transported to the United States for decades, crude oil from Canadian oil sands currently accounts for more than 1 million barrels per day of U.S. oil imports or 21 percent of America’s imported oil.^{50,51}

At least 2,400 U.S.-based companies in 49 states support the development of Canadian oil sands.⁵² And as Canadian oil sands production and investment increases, demand for U.S. goods and services also rises, adding an estimated \$16 billion to U.S. GDP by 2015 and \$77 billion by 2025.⁵³ For every dollar America spends on Canadian oil, almost 90 cents returns to the United States through Canadian purchases of U.S. goods and services.⁵⁴ No other trade partner provides such a strong return.

The Keystone XL pipeline is a critical part of the infrastructure necessary to utilize Canadian energy resources as well as provide a safe and efficient means of transporting increased oil production from North Dakota to market. Once the full pipeline extension is approved, Keystone XL will create 20,000 construction and manufacturing jobs to build the pipeline and could generate more than 100,000 jobs linked to oil sands development within 15 years.^{55,56}

With a reliable and stable trading partner like Canada and increased U.S. production, North American energy can supply 100 percent of America’s liquid fuel needs by 2024.⁵⁷

Increased Access Leads to Job Creation

Increased access to U.S. oil and natural gas resources could create a million new jobs in the next 10 years alone.⁵⁸ Onshore, increased development and U.S. policies that encourage Canadian oil sands development could create an additional 700,000 U.S. jobs and generate more than \$12 billion per year in government revenue by 2030.⁵⁹

Opportunities sit offshore as well. Opening areas off Florida’s coast in the eastern Gulf of Mexico to exploration and production could result in up to 100,000 new jobs in Florida by 2016.⁶⁰

There are also significant resources in the Atlantic. A 2009 Bureau of Ocean Energy Management (BOEM) study estimated that technically recoverable oil and natural gas resources available offshore in Atlantic federal waters could include 3.3 billion barrels of oil and more than 31 trillion cubic feet of natural gas.⁶¹ That is enough oil to supply the state of Virginia for more than 20 years at 2010 consumption levels.⁶²

Overall, increased access to natural resources in the Atlantic and Pacific could support 260,000 jobs and generate \$27 billion in government revenue per year—\$171 billion cumulative—by 2030.⁶³

Alaska is expected to be a critical, strategic asset for the United States in terms of its oil and natural gas potential. Both onshore and offshore, Alaska can help drive the local, state and national economy through energy development.

Becoming a Net Exporter

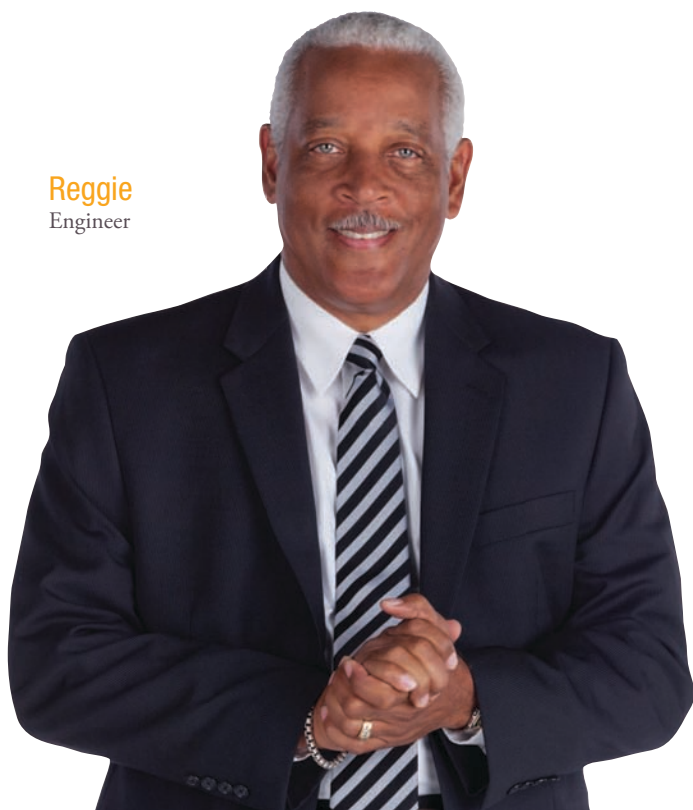
In 2011, the United States became a net exporter of petroleum products for the first time since 1949, thanks to industry investment in domestic oil and natural gas production and refinery upgrades.⁶⁴ While net exports of petroleum products only amount to 2 percent of U.S. consumption, total petroleum product exports account for 8 percent of total U.S. exports, or \$111 billion in 2011.^{65,66} Having the flexibility to export more domestically manufactured products helps reduce America's trade deficit.

The continued export of petroleum products also means jobs for Americans. President Obama has called for doubling U.S. exports by 2015, and Americans recognize the economic benefit of exporting domestically manufactured products of all kinds, including petroleum products.^{67,68}

A December 2012 study commissioned by the Department of Energy found that by allowing liquified natural gas exports, the U.S. would benefit economically, and that exports would have "relatively narrow" impacts on the price of natural gas for U.S. consumers.⁶⁹ The study also said that "across the scenarios, U.S. economic welfare consistently increases as the volume of natural gas exports increased."⁷⁰

Petroleum products are traded globally, and the United States has a long history of exporting certain products, while importing others to balance refinery outputs and global supply and demand. For example, American refiners export diesel to Europe while they import gasoline from abroad due to differences in transportation fleets.⁷¹ Exports can help grow the country's economy, help reverse its trade deficit and help bring back millions of U.S. jobs in engineering, manufacturing, construction and facility operations.

Reggie
Engineer



By the Numbers:

\$545 billion

amount directly provided by the oil and natural gas industry to the U.S. economy in 2011⁷²

\$1.1 trillion

total value added by the energy industry to the national economy, representing 7.3 percent of U.S. GDP⁷³

\$224 billion

wages the industry paid to U.S. employees in 2011⁷⁴

\$268 billion

amount the refining sector contributed to U.S. GDP in 2009⁷⁵

\$86 million

daily amount contributed on average by the oil and natural gas industry to the federal government in taxes, royalty payments, rents, bonus bids and other fees⁷⁶

9.2 million

jobs supported by the oil and natural gas industry⁷⁷

246 million

number of vehicles fueled by U.S. refineries⁷⁸

1 million

new jobs created by 2025 due to shale development and lower natural gas prices⁷⁹

\$109.5 billion

projected amount U.S. households will save between 2009 and 2020 due to lower natural gas prices⁸⁰

3.5 million

jobs expected to be supported by unconventional oil and natural gas resources by 2035⁸¹

Oil and Natural Gas: Supporting Jobs and Economic Growth

The oil and natural gas industry supports 9.2 million fulfilling American jobs, including engineers, geophysicists, chemists, earth scientists and geologists.⁸² Positions in the industry also include carpenters, HR professionals, administrative assistants, botanists, marine biologists, zoologists and jobs far beyond the industry's direct well-to-wheels presence.

Jobs in the oil and natural gas industry are not only incredibly varied, they are also high paying. Payscale.com estimates the typical earnings total for a petroleum engineer over a 45-year career is nearly \$6.3 million, which leads all other careers.⁸³ The average starting pay is more than \$84,000 and, after more than 20 years, the typical salary is \$151,000.⁸⁴ Second on the list, a landman—someone who arranges access to oil and natural gas production sites—will earn \$5.38 million over a 45-year career.⁸⁵ Starting pay averages \$53,600, growing to \$138,000 with more than 20 years' experience.⁸⁶

Industry workers include people like Brian, an operator at a refinery in California, who joined the oil and natural gas industry after working in the auto industry. “The pay is good. The benefits are good,” said Brian.⁸⁷

Another industry employee, Jacqueline, followed in the footsteps of her father and brothers by joining the oil and natural gas industry because it provided challenging work, project management experience and significant responsibility.⁸⁸

The industry also provides opportunities for military veterans. James, a pipeline technician and military veteran, transitioned from a prison guard to the oil and natural gas industry by using his welding certificate and taking advantage of industry on-the-job training.⁸⁹

“In the Marine Corps, we planned operations and went into the field and executed them... And now I plan how to drill a well and then go into the field and see how the plan is executed.”

– Charles Patrick
Drilling Engineer, Apache Corporation
May 2012⁹⁰

In addition to employees like Brian, Jacqueline and James, industry investments lead to jobs not only on well sites or refineries but in other sectors as well. With the growth of the Marcellus Shale, Huntington Bancshares Inc., in Columbus, Ohio, became the third-ranked Small Business Administration lender, up from the 15th spot three years ago—all while adding 500 bankers in the process.⁹¹

“It’s not all about shale, but shale is what’s driving the confidence to keep investing,” says Jim Dunlap, Huntington’s director of regional and commercial banking.⁹²

Natural gas development is also creating thousands of new manufacturing jobs.

Penna Flame Industries, a Pennsylvania company that manufactures gear parts and wheels, has seen its monthly natural gas bill drop from \$10,000 a month in 2008 to almost \$3,000 a month today.⁹³ With these savings, the company is investing in robotics technologies and creating new jobs at this family-owned business.

“When you’re not spending as much in other areas, you can spend more on things like this,” said Gary Lupos of Penna Flame Industries.⁹⁴

The growth of the U.S. oil and natural gas industry has also increased employment opportunities for women. While women have long worked in industry offices as executives, engineers and laboratory scientists, many more are now heading out into the field. As the United States experiences a domestic boom in unconventional resources, so too are employment figures for women working on drill sites. In 2004, 48,900 women worked directly in America’s oil and natural gas fields. In the past seven years, that number has risen to 78,400—an increase of more than 60 percent.⁹⁵

Job opportunities for women are expanding across all managerial levels and sectors. For example, at one U.S.-based company, women accounted for 26 percent of the global workforce and 44 percent of management and professional new hires in 2011.⁹⁶ Across the oil and natural gas industry, women account for nearly 20 percent of the workforce and the industry expects this figure to rise in coming years.⁹⁷

Unconventional Resources Unlocked

Over the last decade, the oil and natural gas industry has seen significant growth in the area of unconventional resource development—resources located in shale and other tight rock formations that were previously thought to be inaccessible.

“By 2030 these nontraditional liquids could add up to a third of total liquids capacity. By then, however, most of these unconventional oils will have a new name. They will all be called conventional.”

– Daniel Yergin
Chairman, IHS CERA
September 2011⁹⁸

Oil and natural gas production in these areas could produce significant growth in capital expenditures and employment, according to a recent IHS Global Insight study. The study estimated capital spending in U.S. unconventional resources in 2012 will hit \$87 billion and lead to more than \$5.1 trillion—or more than two and a half times the 2011 state GDP of California—in capital spending by 2035.^{99,100} Nearly every dollar spent remains in the United States, helping to support and create American jobs.¹⁰¹ In fact, that capital investment could support more than 3.5 million jobs by 2035 and create \$2.5 trillion in tax revenue between now and then.¹⁰²

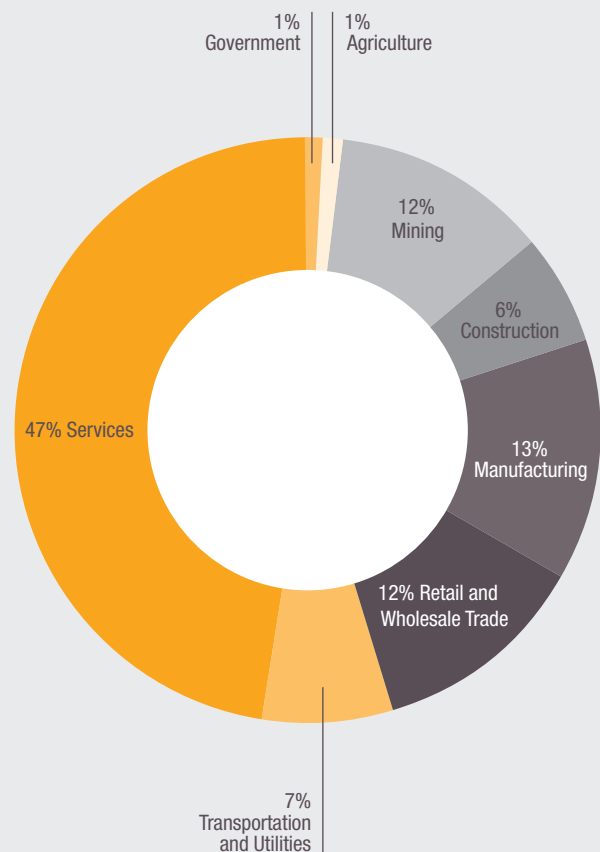
Before accessing these unconventional plays, U.S. crude oil production was on a decline: from 9.6 million barrels per day in 1970 to 5 million barrels in 2008.^{103,104} Thanks to energy from shale, the International Energy Agency (IEA) estimates that the United States will surpass Saudi Arabia in oil production by 2020.¹⁰⁵

In the first quarter of 2012, thanks to production in shale areas, U.S. production climbed to more than 6 million barrels per day.¹⁰⁶ Increases in production in shale areas have increased domestic oil production by 25 percent since 2008.¹⁰⁷ U.S. output from eight tight oil prospects alone is expected to grow to 4.5 million barrels per day by 2020, up from 2 million barrels per day in 2012.¹⁰⁸ Two of the most prolific tight oil prospects are responsible for much of this production—the Bakken Shale, located in western North Dakota and eastern Montana, and the Eagle Ford Shale in Texas.

“What’s happened in the last five years is technologies have significantly increased our projections on the amount of natural gas that’s available in places like in the Bakken formation... In fact, there are some people who are saying it’s as much oil as Saudi Arabia, and we believe it can be a source for United States energy.”

– Ken Salazar
U.S. Secretary of the Interior
April 2012¹⁰⁹

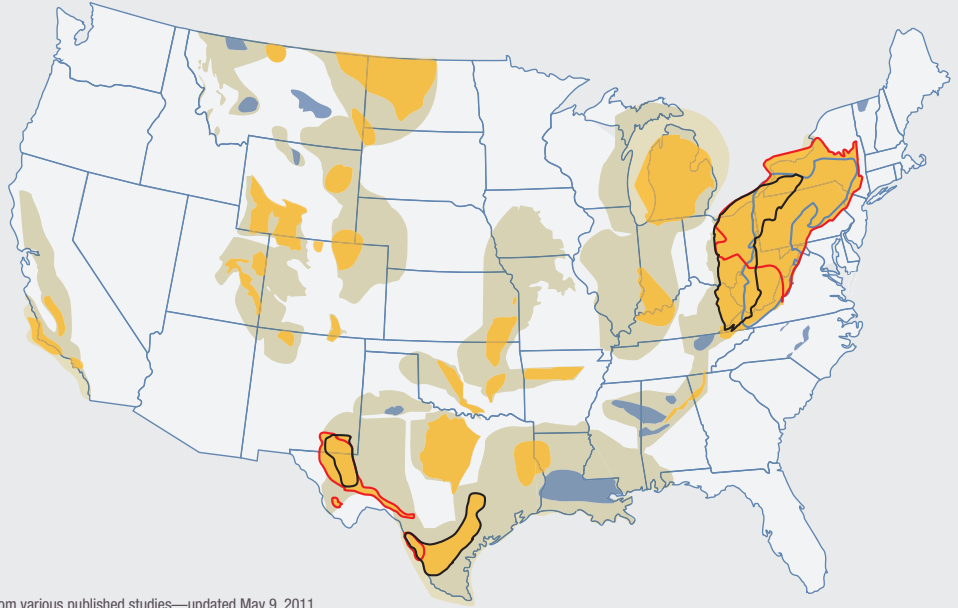
Shale Gas Employment Contribution, 2035
1.66 Million Workers



Source: IHS Global Insight.

Shale Gas Plays

- Current Shale Plays
 - Prospective Shale Plays
 - Basins
- Stacked Plays
- Shallowest/Youngest
 - Mid-Depth/Mid-Age
 - Deepest/Oldest



Source: U.S. Energy Information Administration, based on data from various published studies—updated May 9, 2011.

According to Al Holcomb of the San Antonio-based Lewis Energy Group, the United States was an “energy couch potato” just a few years ago—consuming significant amounts of energy without increasing production.¹¹⁰ That changed with the growth of unconventional oil and natural gas production from shale. “The rest of the world is still sitting,” Holcomb said. “It’s given us an unbeatable edge.”¹¹¹

In addition to increased oil development from unconventional resources, U.S. natural gas production has increased by 25 percent, moving from 53 billion cubic feet per day to 66 billion cubic feet per day over the last five years.¹¹²

The Energy Information Administration (EIA) estimates the United States has 2,203 trillion cubic feet of potential natural gas resources, giving America a nearly 100-year supply.¹¹³ Some actually estimate the U.S. natural gas resource base as high as 3,505 trillion cubic feet, a 144-year supply.¹¹⁴ The Marcellus Shale, which spans portions of Maryland, New York, Ohio, Pennsylvania and West Virginia, may be the second-largest unconventional natural gas field in the world.¹¹⁵ It is estimated to hold more than 500 trillion cubic feet of natural gas, enough to fuel the entire United States for 20 years and potentially worth more than \$1 trillion.¹¹⁶

In 2011, there were 1,965 wells drilled in the Marcellus Shale in Pennsylvania, up from 710 wells in 2009.^{117,118} The Marcellus Shale supports 234,000 jobs in Pennsylvania and companies involved in drilling have paid more than \$1.6 billion in Pennsylvania state taxes since 2006.^{119,120}

Thousands of other indirect or induced jobs have been created and will continue to be supported by oil and natural gas production.¹²¹ In Pennsylvania, state officials reported 5,000 jobs were added for freight trucking and 500 more were created to build roads between 2008 and 2011.¹²²

Nearby, the economic impact of the development of the Utica Shale in Ohio is estimated to grow from supporting 2,275 jobs in 2011 to 65,680 jobs by 2014, a nearly 3,000 percent increase.¹²³ These jobs will provide \$3.3 billion in wages and benefits to workers, up from \$100 million in 2011.¹²⁴ Overall, energy production is projected to generate an increase of \$22 billion in economic activity in Ohio by 2015.¹²⁵

Job growth and economic activity is also booming in Texas. The total number of workers in the Lone Star State reached an all-time high in December 2011, adding more than 200,000 jobs that year, thanks in large part to the oil and natural gas industry and the development of the Eagle Ford and Barnett Shales.¹²⁶

Unconventional resources are poised to continue leading job creation, economic growth and reliable energy in the United States for decades to come—and are soon expected to produce the majority of America’s energy, making them very conventional.

Industry innovation and the advancement of proven technologies, including horizontal drilling and hydraulic fracturing—or fracking—have allowed American workers to access formerly unreachable domestic supplies.

What is Hydraulic Fracturing?

Hydraulic fracturing is a technology that uses water pressure to create fissures—tiny cracks—in deep underground shale rock formations that allow oil and natural gas to flow up the well for collection.

First used in the 1940s, hydraulic fracturing has unlocked massive new supplies of oil and clean-burning natural gas from dense deposits of shale—supplies that increase the country's energy security and improve America's ability to generate electricity, heat homes and power vehicles for generations to come.

In the United States, around 35,000 wells are hydraulically fractured annually. More than 1 million wells have been hydraulically fractured since the late 1940s,¹²⁷ without one case of groundwater contamination due to the use of this proven technology.^{128,129} The geology of each well is a little different, and consequently, wells are designed to best address individual conditions. The production sector has developed robust best practices based on its vast experience in order to minimize the environmental and community impacts associated with development.

API has developed a series of standards and recommended practices covering all aspects of hydraulic fracturing operations, and promotes their use throughout the industry while making them broadly available by posting these documents for free on the API website.

The hydrocarbons produced through hydraulic fracturing are used as building blocks for the plastics and polymers needed to bring renewables such as solar and wind online. Without hydraulic fracturing, these low-cost building blocks would not be available for use in renewable energy, as 80 percent of natural gas wells over the next decade will require hydraulic fracturing.¹³⁰

Hydraulic Fracturing Process

The process of bringing a well to completion generally takes only a few months for a single well, after which it can produce oil and natural gas for 20 to 40 years.¹³¹ The process for a single horizontal well typically includes four to eight weeks to prepare the site for drilling; four or five weeks of rig work, including casing, cementing and moving all associated auxiliary equipment off the well site before hydraulic fracturing operations commences; and two to five days for the entire fracturing operation.

In a hydraulically fractured well, fracturing fluids consisting primarily of water, sand and a small amount of chemicals are injected under high pressure into the producing formation, creating fissures that allow oil and natural gas to move freely from rock pores where they are trapped. The geology of the earth creates a natural, impermeable barrier of rock between the fissures and the groundwater several thousand feet above.

Typically, steel pipe known as surface casing is cemented into place at the uppermost portion of a well for the explicit purpose of protecting groundwater. The depth of the surface casing is generally determined by the depth needed to ensure groundwater protection, among other factors. As the well is drilled deeper, additional casing is installed to isolate the formation from where oil or natural gas is to be produced. This further protects groundwater from the producing formations.

These redundant layers of steel and cement create an effective, protective barrier between oil and natural gas in the well and underground water supplies.

Casing and cementing are critical parts of the well construction that not only protect any water zones, but are also important for extracting oil or natural gas. Industry well design practices protect sources of drinking water from the other geologic zones of an oil and natural gas well with multiple layers of impervious rock.

Hydraulic Fracturing Fluids

Water accounts for about 90 percent of the fracturing mixture and water pressure creates the tiny fissures in shale formations. Sand acts as a proppant to hold the fissures open and accounts for about 9.5 percent of the fluids.¹³² Chemicals act as lubricant and account for the remaining half percent of the fluids.¹³³

There are several ways oil and natural gas companies manage spent or used fracturing fluids. One way has the fluids recovered at the initial stage of well production and recycled in a closed system for future use. Alternatively, recovered water and fluids may be disposed of under regulation, by either surface discharge where authorized under the Clean Water Act or by injection into Class II wells as authorized under the Safe Drinking Water Act. Non-drinkable water supplies are also increasingly being used as part of the process instead of fresh water.

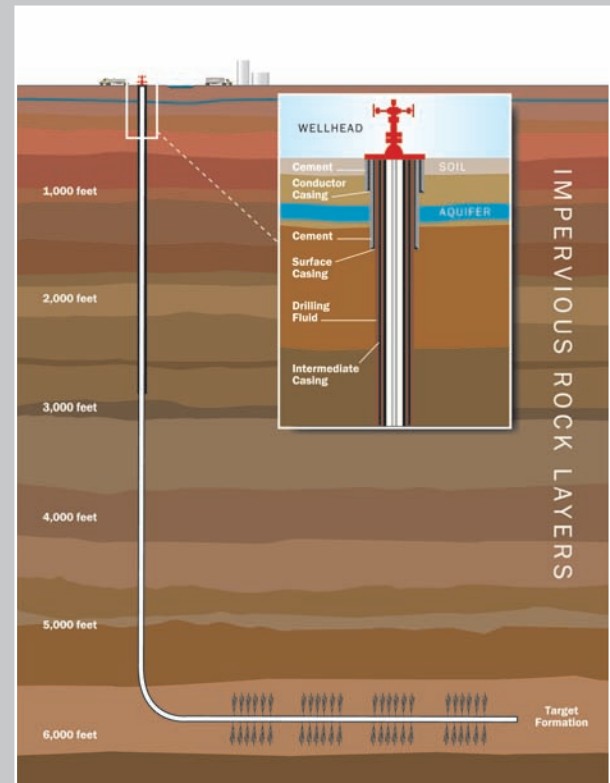
One company with natural gas production operations in southeastern New Mexico takes non-drinkable water and treats it for use in its drilling operations to reduce the amount of fresh groundwater that has to be used.¹³⁴

In addition to operating safely, the industry is committed to transparency in the hydraulic fracturing process. To meet that commitment, industry companies participate in FracFocus, a website created to publicly disclose the chemicals used in the hydraulic fracturing process. The site provides detailed information about the purpose chemicals serve and how groundwater is protected on a well-by-well basis.

FracFocus began in April 2011 and in its first year saw more than 200 energy-producing companies register over 15,000 well sites.¹³⁵ Since the first year, the numbers have continued to grow, with more than 33,000 well sites now listed.

Hydraulic fracturing technology has a strong environmental track record and is employed under close supervision by state regulators. The oil and natural gas industry is committed to the continued safe and responsible development of domestic resources and ensuring that the public is part of the conversation. Most natural gas wells drilled in the next decade will require hydraulic fracturing, so utilizing this technology is important to meeting future U.S. energy needs.¹³⁶

Groundwater Protection through Proper Well Construction



Brenda
Operating Engineer





Investing in Technology
and the Environment

Investing in Technology and the Environment

The oil and natural gas industry serves as environmental stewards and technological innovators. From offshore rigs in the Gulf of Mexico to onshore wells in the Marcellus Shale to world class refineries, the industry continues to invest in innovative new technologies and tools to access, produce, refine and distribute America's domestic resources in an environmentally sensitive way.

“The development of natural gas will create jobs and power trucks and factories that are cleaner and cheaper, proving that we don’t have to choose between our environment and our economy.”

– Barack Obama
U.S. President
January 2012¹³⁷

Investing in Technology

The significant oil and natural gas discoveries announced today are often the result of investment as far back as a decade ago. Since 2000, the industry has invested nearly \$2.4 trillion in U.S. capital projects to meet the growing demand for oil and natural gas.¹³⁸ Whether it is exploration and production, refining, energy transport or research and development, the industry is on the cutting edge of advanced technology.

For example, due to innovation such as hydraulic fracturing and horizontal drilling, the United States has become the leader in shale drilling. Other nations are looking to the United States for technologies that can help their countries extract oil and natural gas.¹³⁹ Hydraulic fracturing has been used in more than 1 million U.S. wells, safely producing more than 7 billion barrels of oil and 600 trillion cubic feet of natural gas since the 1940s.¹⁴⁰

“Every single company, every single operator in the international environment wants American experience and we simply don’t have enough people.”

– Peter Richter
Vice President of Marketing and Technical Operations
Schlumberger
September 2012¹⁴¹

Enhanced Oil Recovery

Oil and natural gas producers are leaders in enhanced oil recovery (EOR) technologies that increase the amount of energy accessible from wells and improve efficiency. To improve the recovery rate when a field ages and production declines, engineers may inject steam, chemicals or gases to force more oil out and increase productivity. Boosting oil recovery through this method could unlock around 60 billion barrels of oil in the United States, according to the Department of Energy.¹⁴²

The U.S. oil and natural gas industry also leads the world in CO₂ EOR technology, which helps not only increase the yield of depleted or high viscosity fields, but also can permanently sequester the injected CO₂—increasing recovery from some oil reservoirs by 4 to 15 percent.¹⁴³ In fact, the industry performs approximately 96 percent of worldwide CO₂ EOR in the United States.¹⁴⁴

“I am excited to see the work being done to move forward on this first generation of enhanced oil recovery projects.”

– Kent Conrad
U.S. Senator (D-N.D.)
August 2012¹⁴⁵

Steam-Assisted Gravity Drainage

For extraction of heavy oils like oil sands, the industry has developed Steam-Assisted Gravity Drainage (SAGD) drilling technology to more efficiently extract oil from deposits that cannot be mined. This technology uses horizontal wells and steam to extract these heavy oils from the ground. By using SAGD, the industry is now able to extract 70 percent of its un-mineable oil sands reserves, up from 25 to 30 percent recoverable utilizing previous technology.¹⁴⁶

Since the first generation of SAGD projects about a decade ago, the industry has made several energy-saving innovations. These include improved reservoir characterization, electric submersible pumps and improved wellbore liners. As a result of these advances, the amount of steam—and thus energy—needed to produce a barrel of oil from SAGD has declined 18 percent.¹⁴⁷

3-D and 4-D Seismic

Extending the life and maximizing recovery from producing fields is critically important to efficiently extracting oil and natural gas. 3-D seismic technology uses sound waves to form sharp images of underground formations to help the industry find where oil and natural gas lie. The industry added a new dimension—time—to maximize recovery. This 4-D seismic technology compares 3-D seismic surveys in different time

intervals, such as before an offshore field begins production and other post-production stages to maximize recovery. In the Gulf of Mexico, technological advances in 3-D and 4-D seismic technology have helped increase government estimates of offshore resources from 9.5 billion barrels of oil in 1987 to 48.4 billion barrels in 2011, a five-fold increase in reserve estimates.^{148,149}

Refining and Fuel Advancements

U.S. refineries use pioneering, world-class technology to produce the fuels Americans use today. The sector invests billions of dollars each year to maintain its competitiveness and environmental performance.¹⁵⁰ To meet demand and upgrade to cleaner technology, refiners have expanded capacity at existing plants by 14.6 percent since 1992—the equivalent of building a new refinery each year.¹⁵¹

Refiners also invest in technological improvements that make fuels cleaner and more efficient. Investments significantly increased in 2006, when refiners began to produce Tier 2 gasoline and later ultra-low sulfur diesel (ULSD) for consumer use. These fuels enable older vehicles to run cleaner and have led to advanced emissions controls for newer vehicles. According to the Environmental Protection Agency (EPA) and the California Air Resources Board, switching from regular diesel to ULSD, when used in vehicles with advanced emission control devices, helps reduce emissions of hydrocarbons and nitrogen oxides, as well as particulate-matter, to near zero levels.¹⁵² On a similar note, the complete transition to Tier 2 gasoline in 2006 resulted in the reduction of nitrogen oxide tailpipe emissions by 77 percent for passenger cars and as much as 95 percent for pickup trucks, vans and SUVs—the equivalent of taking 164 million cars off the road.¹⁵³

Pipelines

Pipelines are the safest and most efficient way to move crude oil, finished products and natural gas to areas where they are needed. The industry invests in technologies to continually improve the safety of pipelines.

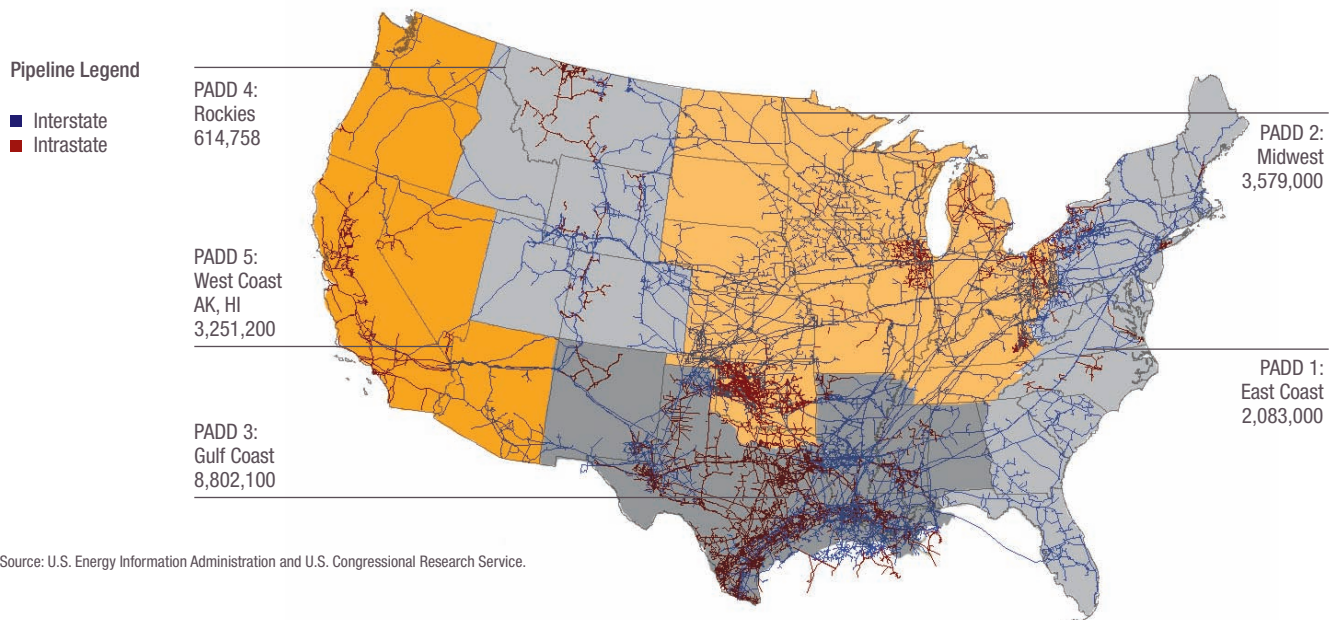
Pipe is carefully selected and tested during manufacturing, and X-ray or ultrasonic testing is conducted for welds during construction. Crude oil and pipeline operators regularly run sensors called “smart pigs” through their pipelines to detect internal and external corrosion, dents, gouges or cracks. If deterioration is detected that poses a threat to the pipeline, the pipeline is repaired. The most advanced monitoring and control systems are in place 24/7 to ensure any significant leaks are stopped quickly. Continued research and development has led to new coating systems and other protections to prevent corrosion and cracking.

Pipeline operators are leading efforts to revolutionize leak detection sensors and software on a continual basis. Industry-led research has spearheaded the development of mobile leak-detection vehicles, which are approximately 1,000 times more sensitive than traditional detection equipment.¹⁵⁴ These vehicles travel along elevated and buried pipeline routes and can accurately detect leaks from pipelines based on air sensors. This emerging technology could detect unauthorized intrusion in the pipeline right-of-way and methane levels of one part per billion in ambient air.¹⁵⁵

Operators also conduct extensive public awareness programs to educate people who live and work along the pipeline right-of-ways, as well as local officials and fire and rescue workers.

U.S. Natural Gas Pipeline Network (2009) and Fuel Refining Capacity (Bbl/Day)

by 2010 Petroleum Administration for Defense Districts (PADDs)



Source: U.S. Energy Information Administration and U.S. Congressional Research Service.

Investing in the Environment

Since 1990, the industry has invested \$252.8 billion toward improving the environmental performance of its products, facilities and operations.¹⁵⁶ Of that amount, U.S. refiners have invested \$137.6 billion in technologies to produce even cleaner fuels and meet the growing variety of state and local mandates for fuel formulation.¹⁵⁷

Between 2000 and 2010, the U.S. oil and natural gas industry invested \$71 billion in technologies that reduced greenhouse gas emissions (GHG), more than the federal government (\$43 billion) and almost as much as the rest of private industry (\$74 billion).¹⁵⁸ In 2011 alone, the industry invested an estimated \$11 billion in environmental expenditures for safer, cleaner and more efficient operations.¹⁵⁹

To help meet future U.S. energy demand growth and to diversify the nation's energy portfolio, U.S. oil and natural gas companies invested an estimated \$121.3 billion from 2000 through 2007 to create cleaner fuels and fund ongoing environmental initiatives in the North American market.¹⁶⁰ This investment represents 65 percent of the estimated total of \$188 billion spent by U.S. companies and the federal government.¹⁶¹ These include investments in wind, solar, geothermal and landfill digester gas.



Nick
Elevator Mechanic

Carbon Capture and Storage

Carbon Capture and Storage (CCS) is a promising set of technologies for the safe and effective capture, transportation and injection of carbon dioxide into deep underground geological formations for permanent storage. While component technologies have been used by the U.S. oil and natural gas industry for years, they have not yet been combined and operated on a large-scale at critical emission sources like power plants, where costs are too high and reliability is too uncertain for large-scale deployment. However, the oil and natural gas industry continues to invest millions of dollars annually toward developing CCS technologies through university research programs such as the Global Climate and Energy Project, Gulf Coast Carbon Center and the Carbon Sequestration Initiative.^{162,163,164}

Industry also continues to expand its own use of CCS technologies. For example, a natural gas processing plant in Wyoming has expanded its capture capability to approximately 365 million cubic feet of CO₂ per day—making it the largest capture facility in the world.¹⁶⁵

CO₂ Emissions Reductions

Due to a number of power plants switching from coal to natural gas, a milder winter and lower gasoline demand, carbon dioxide emissions hit a 20-year low in the beginning of 2012.¹⁶⁶ According to the IEA, from 2006 to 2011, American emissions fell by 430 million tons (7.7 percent)—the largest reduction of all countries or regions.¹⁶⁷ To enable these declines, the industry has invested \$810 for every U.S. man, woman and child since 1990 toward improving the environmental performance of industry products, facilities and operations.¹⁶⁸

This includes projects such as the installation of improved plunger lift seals, which are used to maximize production on mature or underperforming wells, and lower emission well-completion technology.¹⁶⁹

With natural gas increasingly used to meet electricity generation, the EPA has found that compared to the average air emissions from coal-fired generation power plants, natural gas power plants produce half as much carbon dioxide, less than a third as much nitrogen oxides, and virtually no sulfur oxides.¹⁷⁰ Industry investments in energy from shale resources have unlocked significant amounts of natural gas, which is making the United States' carbon footprint much smaller.

GHG emissions from the U.S. oil and natural gas industry have declined by 157 million metric tons of carbon dioxide equivalent from 2008 through 2010, a reduction comparable to taking 31.5 million cars off the road.¹⁷²

One study found that 38 to 46 percent of the industry's emission reductions from 2008 to 2010 occurred in the fuel substitution category.¹⁷³

“Natural gas is an extraordinary resource in this country. In just a few years, based on new technology (fracking), we’re at a point where we can think about natural gas for power generation and for transportation. That’s huge because it can be 40 percent less carbon intense. I’m an environmentalist. I want to see it developed, and I want to see it developed well.”

– Lisa Jackson
U.S. EPA Administrator
May 2012¹⁷¹

Improving Efficiency

Energy efficiency is the cleanest, quickest and most cost-effective way to extend today’s energy supply into the future. The greatest “new” source of energy comes from reduced demand and greater efficiency and conservation. In fact, America uses about half as much energy today for every dollar of GDP as it did back in 1970.¹⁷⁴

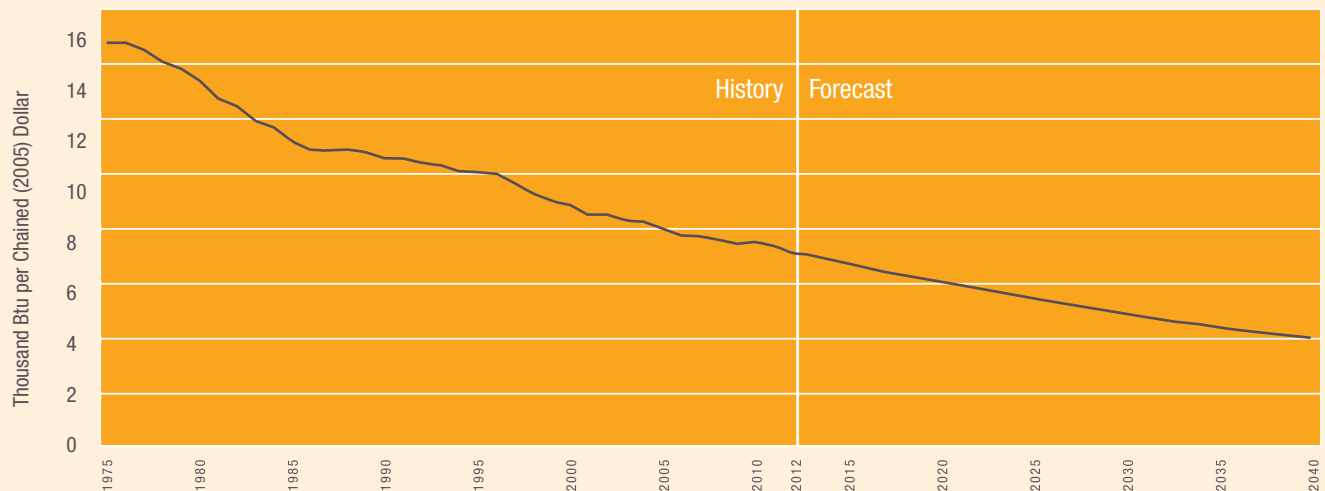
One of the ways the industry is working to improve the efficiency of its operations is through cogeneration—also known as combined heat and power (CHP). The cogeneration process uses steam and electricity produced at facilities to create additional power, and it can simultaneously yield efficiency rates far greater than the separate generation of electricity and steam.¹⁷⁵

Innovative CHP technology has improved operations efficiency by 50 percent, resulting in a 32 percent fuel-use savings according to the EPA, thus lowering emissions.¹⁷⁶ CHP produces the same electrical and thermal output at 75 percent fuel conversion efficiency, compared to 51 percent efficiency with separate heat and power.¹⁷⁷ Between 2000 and 2010 alone, the energy industry invested \$5.9 billion in cogeneration technology in order to reduce CO₂ emissions and work generally to lessen its environmental impact.¹⁷⁸ Industry investments in end-use technologies like CHP from 2000 to 2010 total more than \$38.5 billion, which represents more than 38 percent of the estimated total spent by U.S. companies and the federal government in this area.¹⁷⁹

The industry is also improving efficiency by developing new techniques that heat shale underground to extract oil.¹⁸⁰ One company is using subsurface heaters to slowly heat shale rock, which releases oil and natural gas and allows it to be brought to the surface with traditional pumps.¹⁸¹ An advantage to this process is it significantly reduces—and in some cases eliminates—the environmental impacts from previous shale oil recovery methods.

Future U.S. Energy Demand per Dollar of GDP—Growing Efficiency

(Million Cubic Feet)



Source: U.S. Energy Information Administration, “Monthly Energy Review,” November 2012; “Annual Energy Outlook 2013,” December 5, 2012.

Since 1990, Canadian oil sands development has become remarkably more efficient—the amount of GHG emissions per barrel has decreased by 26 percent, according to the Canadian government.¹⁸²

The oil and natural gas industry has and will continue to make significant investments in technology and environmental safeguards to ensure that operations are conducted efficiently and with as minimal of an environmental footprint as possible.

By the Numbers:

\$252.8 billion

amount invested by the oil and natural gas industry since 1990 toward improving the environmental performance of its products, fuels, facilities and operations, or \$810 for every U.S. man, woman and child¹⁸³

430 million tons

reduction of greenhouse emissions in the United States over the last five years¹⁸⁴

\$71 billion

industry investment from 2000 to 2010 on low and no-carbon energy technologies, more than the federal government (\$43 billion) and almost as much as the rest of private industry (\$74 billion)¹⁸⁵

26 percent

GHG emissions reductions per barrel of Canadian oil sands since 1990¹⁸⁶

\$5.2 billion

amount spent on environmental expenditures by U.S. refiners in 2011¹⁸⁷

Developing Next Generation Technologies

The oil and natural gas industry consistently works to meet America's energy needs and is developing next generation energy technologies to ensure reliable and affordable energy for the future. It is also investing in key environmental programs to limit the emissions and environmental footprint of industry operations.

Industry employees like George, a geophysicist in Houston, work with new technologies to improve efficiency. George uses 3-D and 4-D seismic technologies to analyze data and visualize what's going on deep inside the earth—allowing him to decide where to drill for oil and natural gas.¹⁸⁸

This technology has also resulted in greater well efficiency, lessened environmental impact and improved safety conditions. These “digital oil field” technologies allow companies to gather and analyze data throughout the job site using fiber-optic sensors in drilling equipment that are controlled manually by operators or automatically by information systems.¹⁸⁹ The sensors transmit data about the well, alerting operators if equipment is failing to prevent hazards and allowing for instant drilling adjustments.¹⁹⁰

One company, in partnership with a leading university, is developing Advanced Ceramic Proppants, a product which augments oil and natural gas production—both rate and total recovery—and reduces the environmental impact of hydraulic fracturing.¹⁹¹ Through the application of nanotechnology, these proppants help keep fractures open to allow for extraction of oil and natural gas, and travel deeper into formations than other types of proppants.¹⁹²

Another innovation to lessen environmental impact is the “freeze wall” used in conjunction with kerogen oil shale development. While still in development, researchers at a Rio Blanco, Colo., facility are using ground-freezing technology to create an underground barrier—or “freeze wall”—around extraction zones.¹⁹³ This wall is created by refrigerated fluid, pumped through a series of wells drilled around the perimeter of the extraction zone—keeping groundwater and oil in the project perimeter.¹⁹⁴

Industry is also making significant investments to help grow alternative energy and technologies and reduce emissions.

One company in California recently completed a project that uses solar power to create the steam needed for EOR.¹⁹⁵ Using more than 7,000 mirrors across 100 acres, solar panels heat water to produce steam that is then used throughout the extraction of oil with enhanced recovery techniques.¹⁹⁶ The facility generates 29 megawatts of energy and is the world's largest solar thermal EOR facility.¹⁹⁷ By using EOR methods like this solar thermal project, one report estimated in 2009 that 241.7 billion barrels of oil could be added to proven reserves worldwide.¹⁹⁸

Many companies have helped to develop "hybrid plants" where solar and wind facilities are supported by natural gas.¹⁹⁹

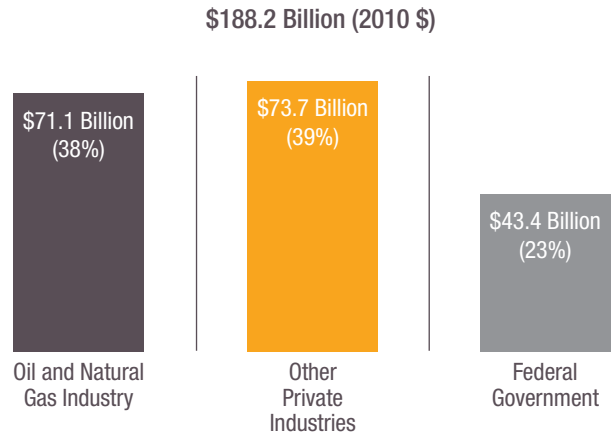
Florida Power & Light currently operates a 3,722-megawatt natural gas facility in Martin County, the largest fossil fuel plant in the country. In 2011 they added a 75-megawatt plant that uses recycled heat from its systems to generate steam and produce power.²⁰⁰ This advanced renewable energy technology reduces CO₂ emissions.²⁰¹

Refineries across the country are using and updating Wet gas scrubber technology, which helps the industry meet and reduce emissions while maintaining efficient refining operations. This technology works as a giant washing machine to reduce emissions and improve air quality in and around refineries. Wet gas scrubber technology is an important development that may collect flammable and explosive dusts safely, absorb gaseous pollutants and cool hot gas streams.²⁰² For example, at one refinery in Channahon, Ill., Wet gas scrubbing technology reduced sulfur oxide emissions from two main point sources by 97 percent.²⁰³

Improved technologies and efficiency measures are helping the industry produce, refine and distribute efficiently, while minimizing its environmental footprint.

Carbon Mitigation Investment by Investor Group

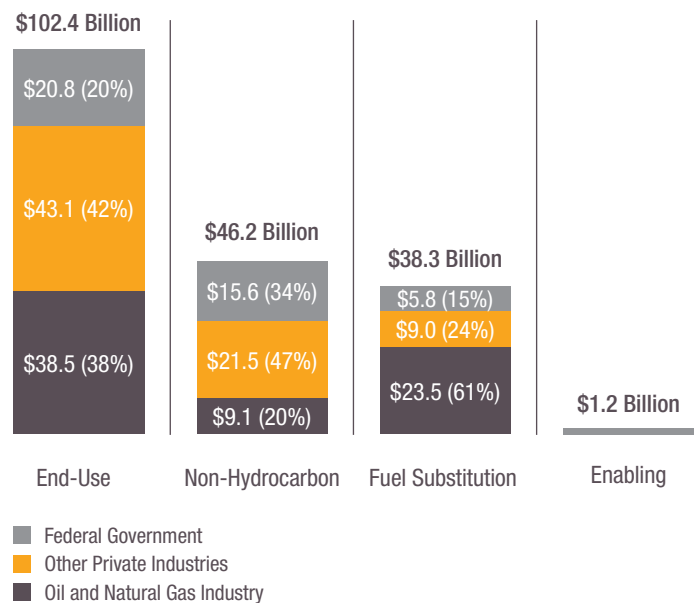
(2000 – 2010)



Source: T2 & Associates, "Key Investments in Greenhouse Gas Mitigation Technologies from 2000 Through 2010 by Energy Firms, Other Industry and the Federal Government." October 2011.

Carbon Mitigation Investment by Technology and Investor Group

(2000 – 2010)



Source: T2 & Associates, "Key Investments in Greenhouse Gas Mitigation Technologies from 2000 Through 2010 by Energy Firms, Other Industry and the Federal Government." October 2011.

Refining in the United States

The U.S. refining sector transforms crude oil into fuel and other key products used every day, such as gasoline, diesel, jet fuel and home heating oil, as well as the petrochemicals that serve as building blocks for thousands of vital products used in daily life like plastics, pharmaceuticals, medical devices and many more.

With 144 refineries and a total operable capacity of 17.3 million barrels per day, U.S. refineries are a critical, strategic asset that provide vital products needed to power the U.S. economy and enhance the quality of American lives.²⁰⁴

Refining Capacity

Historically, the U.S. refining sector's products have met almost 90 percent of total demand for oil products in America. In fact, the United States has the largest refining sector of any country, with more than 17 million barrels per day of refining capacity, nearly double the refining capacity of the second largest refining country, China.²⁰⁵

Industry investments have increased U.S. refining capacity, even as the number of refineries in use has declined. Industry advancements have increased U.S. refining capacity by 14.6 percent from 1992 to 2011.²⁰⁶

In 2011, the average utilization rate—the ratio of an industry's actual output to its estimated potential output—for U.S. manufacturing industries was 75.5 percent, while U.S. refiners had a 86.3 percent average utilization rate.^{207,208} To compare, computer and electronic product manufacturers had a 77.8 percent utilization rate and motor vehicles and parts manufacturers had a 64.1 percent utilization rate in 2011.^{209,210,211}

Diverse Products

U.S. refineries are configured to process different types of crude oils and produce high-quality fuels, petrochemical feedstocks and other products, adding significant economic value to the United States.

The refining sector is a leader in technological advancement and investment in clean fuels. Because of recent government regulations and technological improvements, gasoline refined and marketed today is far different from what it was even a few years ago. The industry has developed many new blends of gasoline to help communities meet regional and state air quality regulations. As a result, 15 different kinds of gasoline are sold across the country.²¹²

Economic Benefits

Refining directly employs approximately 108,000 American workers, high-paying jobs with an average income of \$94,500, and in total supports roughly 540,000 jobs.^{213,214}

As a critical component of the nation's economy, the refining sector generated nearly \$78 billion in wages for direct, indirect and induced job positions, and contributed more than \$268 billion to U.S. GDP in 2009—or nearly 2 percent.²¹⁵

Importance of Refining to U.S. Energy Security

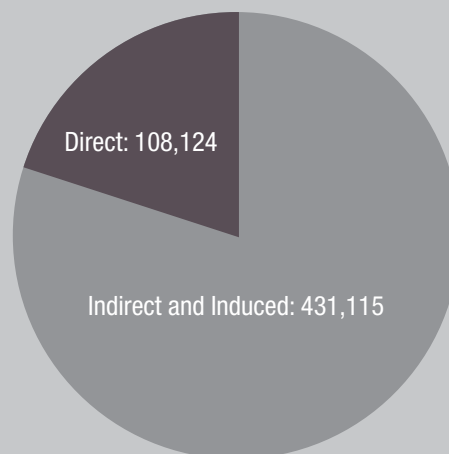
With a strong domestic refining sector, the United States is able to decrease its dependence on imported petroleum products. The refining sector operates on a global basis with fluctuating consumer demand for oil and natural gas, but America must either manufacture these products at home or import them from other countries. To replace declining crude oil imports from Mexico and Venezuela, U.S. refineries are expanding and upgrading equipment to process heavier crudes, including those available from Canadian oil sands.

State Department approval of the Keystone XL pipeline expansion could bring 830,000 barrels per day from Canada and North Dakota to Gulf Coast refineries within the decade, creating thousands of jobs and spurring economic growth.²¹⁶

The refining sector provides the nation's military with secure fuels and provides affordable and clean fuel products to industries that rely on them to manufacture hundreds of thousands of consumer products that Americans depend on every day.

U.S. Refining Industry Supported Employment

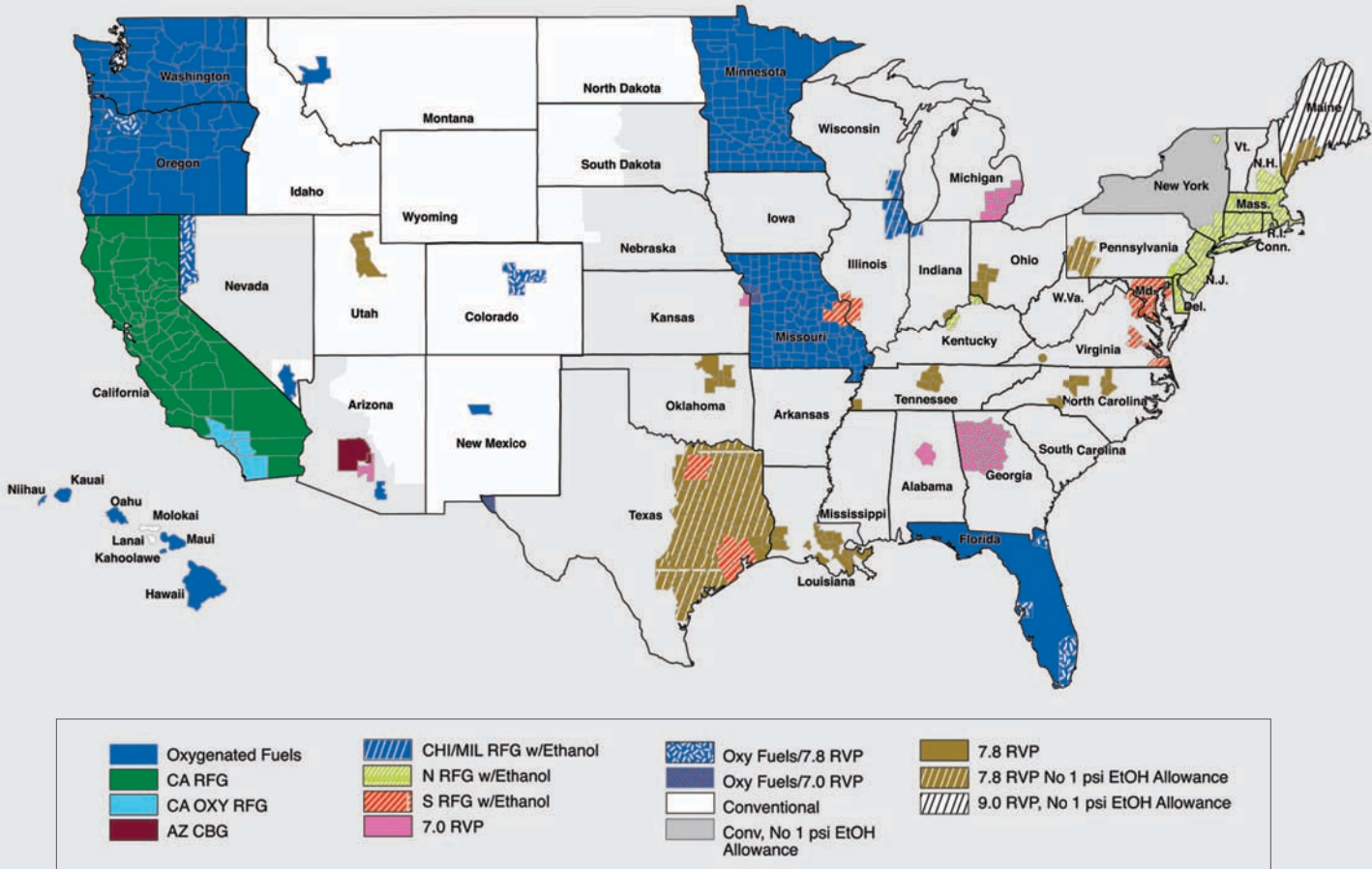
Total: 539,239 Jobs



Source: Wood Mackenzie Analysis; PricewaterhouseCoopers, "The Economic Impacts of the Oil and Natural Gas Industry on the U.S. Economy in 2009: Employment, Labor, Income and Value Added," May 2011.

U.S. Gasoline Requirements

Refiners produce 15 different formulations of gasoline to meet state and local fuel standards



Source: U.S. Energy Information Administration and U.S. Congressional Research Service.

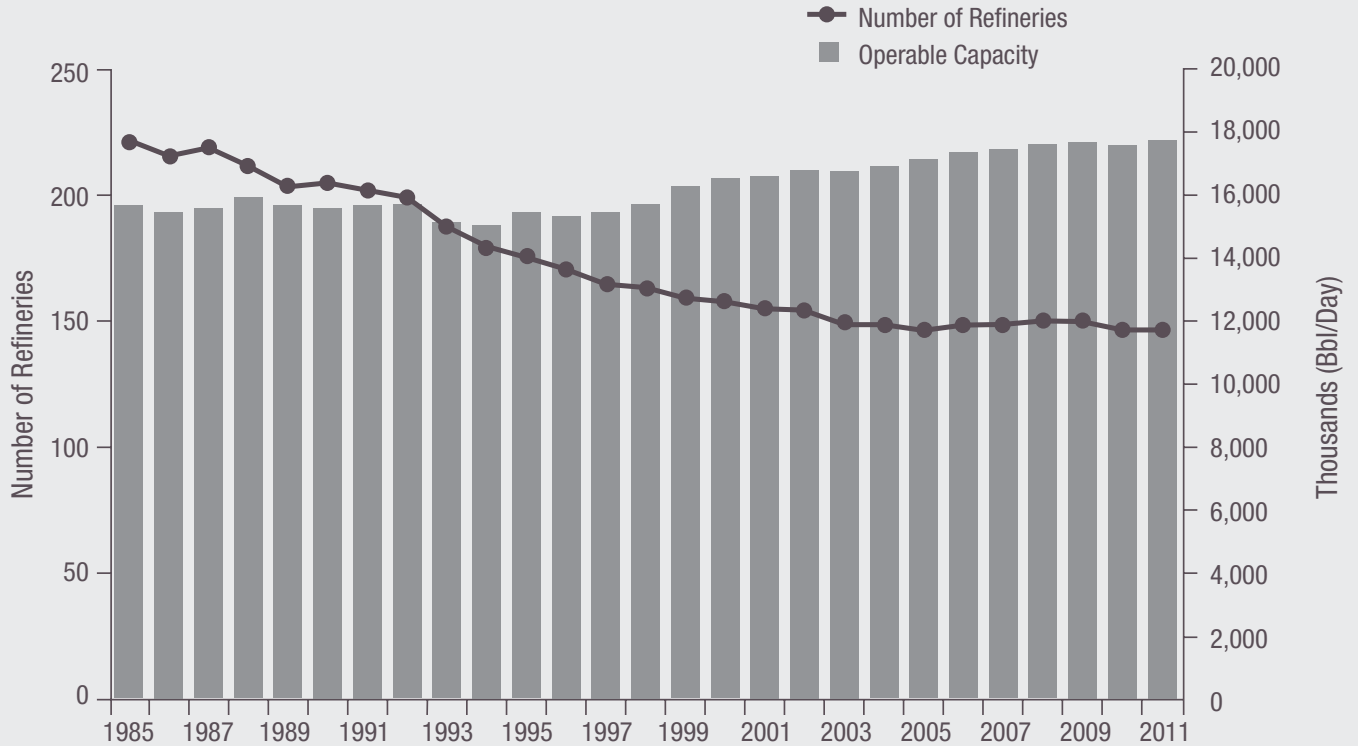
Leaders in Biofuels

The U.S. refining sector's research and development efforts in biofuels are significant, and in partnership with universities, alternative energy companies and the scientific community, U.S. refiners will continue to invest in the development of renewable and conventional fuels. One company is committed to spend \$600 million or more to research the feasibility of turning algae into a bio-oil.²¹⁷ Another is focused on "green crude," or biomass-based fuels with a chemical composition similar to crude oil. This green crude is similar to products already made from crude oil and would require no special infrastructure or vehicles to be processed, stored or used, and is compatible with current engine technology.²¹⁸

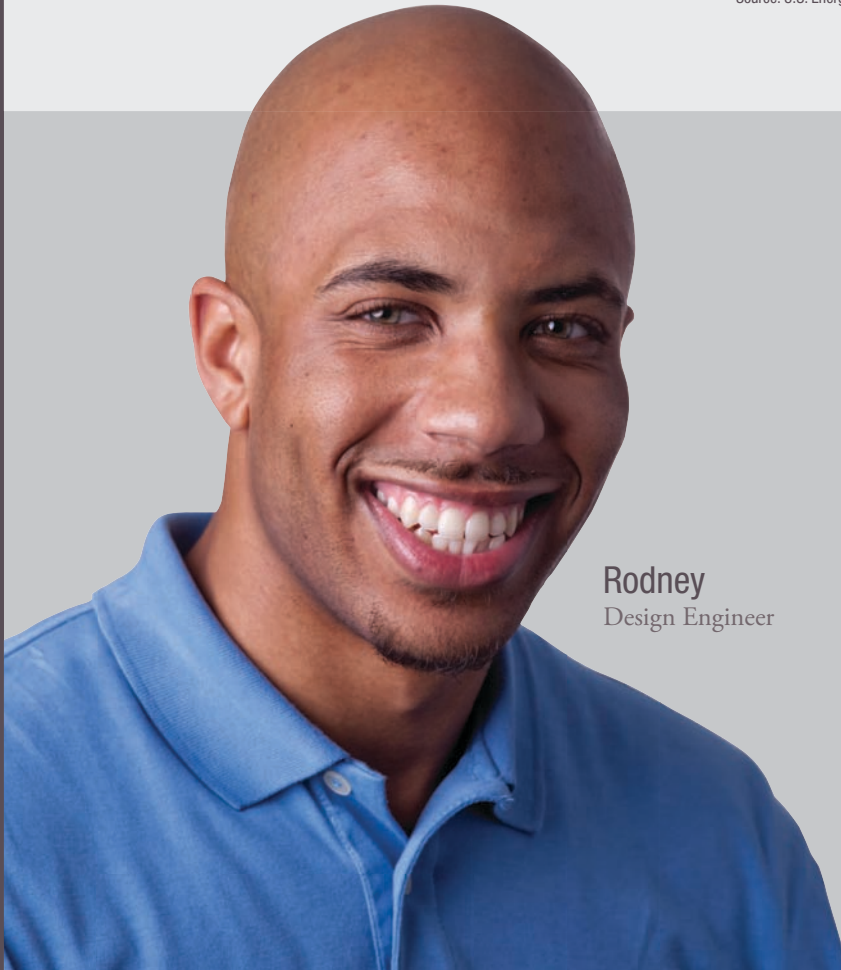
U.S. refiners also blend gasoline with corn ethanol to meet the requirements of the Renewable Fuel Standard (RFS), passed as part of the Energy Independence and Security Act of 2007. In 2011, refiners blended 13.9 billion gallons of ethanol into gasoline.²¹⁹

U.S. Refining Capacity

Number of Refineries Declines but Capacity Expands



Source: U.S. Energy Information Administration, "Petroleum Supply Annual (Volume 1)."



Rodney
Design Engineer

“Today, energy cuts across the entirety of U.S. foreign policy. It is a matter of national security and global stability. It is at the heart of the global economy. It’s an issue of democracy and human rights. It has been a top concern of mine as secretary. And it is sure to be the same for the next secretary of state.”

– Hillary Clinton
U.S. Secretary of State
October 2012²²⁰



Investing in Communities

Investing in Communities

While the United States continues to recover from a deep recession, some communities are experiencing unprecedented economic revivals stimulated by oil and natural gas development.

More than 30 states have seen oil and natural gas support employment rise by approximately 50 percent in the past decade, including suppliers and service companies that work with energy companies.²²¹ This growth is happening not only in states with significant oil and natural gas production, but also in states that have limited or no production.

The Marcellus Shale in the northeast and the Barnett Shale in Texas have boosted local economies—generating royalty payments to property owners, providing tax revenues to the government and creating much-needed, high-paying jobs.

Areas in Pennsylvania with Marcellus Shale activity have among the lowest levels of unemployment in the state. For example, Susquehanna County, an area that has industry activity, saw its unemployment rate drop to 6.6 percent in September 2012, while Philadelphia County, an area away from the Marcellus activity, had an unemployment rate of nearly 11 percent.²²² In 2010, natural gas producers and support companies paid more than \$1 billion in state and local taxes in Pennsylvania.²²³

Oil and natural gas companies are active and responsible members of the communities in which they operate. The industry recognizes that it receives its license to operate from the public and must work to uphold its part of the agreement. Companies work together with local communities to protect the environment, support education and develop local infrastructure. Doing so creates a more stable and desirable environment for communities to prosper and businesses to operate.

The industry is also investing in developing minority and women-owned businesses. In 2011, one company directly spent \$869 million for materials and services from minority and women-owned businesses, in addition to the \$181 million spent through contracts where suppliers purchased from minority and women-owned businesses—a total expenditure of more than \$1 billion.²²⁴

During an emergency, such as a hurricane, the industry is committed to helping local communities. Partnering with the Federal Emergency Management Agency, the industry worked tirelessly to ensure fuel reached affected communities in the wake of Hurricane Sandy. One company alone delivered at least 180,000 gallons of gas and diesel to the New Jersey area, as well as provided fuel and support at military bases for the National Guard and the U.S. Postal Service.²²⁵

Investment in Infrastructure

Earning and maintaining the trust of local communities in which the oil and natural gas industry operates is vital to its success. Many companies with facilities such as refineries, natural gas plants, pipelines and drilling operations, inform citizens about facility operations and what provisions are in place to protect the health and safety of the community.

Operators listen to community concerns, respond appropriately and carry out impact assessments before making any major change to an existing operation or starting a new project. This includes consulting local community concerns regarding potential positive and negative effects of a project, and modifying projects when appropriate.

For example, energy operators in Weld County, Colo., are doing their part to make sure local roads are not only maintained during operations, but improved. One energy company spent about \$150,000 to improve roads in a single town, while another paved roads in a neighboring town.²²⁶

Similarly, the oil boom in the Bakken Shale has led many industries to upgrade rail infrastructure and provide new transport capabilities for the region, which is aiding local manufacturers. One company is building a \$50 million rail terminal to send 107-car trains out of the Bakken.²²⁷

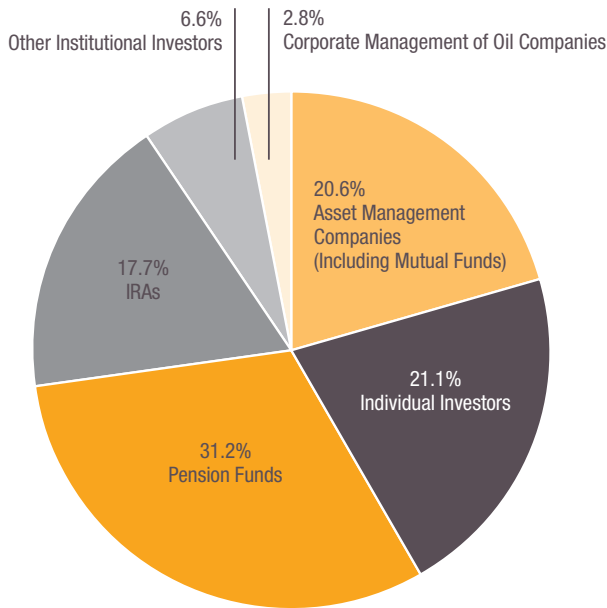
In Louisiana, another company opened a rail terminal in April 2012, giving it expanded access to Gulf Coast refining markets with new connections to pipelines, storage and barge facilities in the area, which also helped to create jobs and other infrastructure investments in local communities.²²⁸

Investments in infrastructure further reinforce the partnership the oil and natural gas industry has in the communities in which it operates.



Tim
Pipefitter

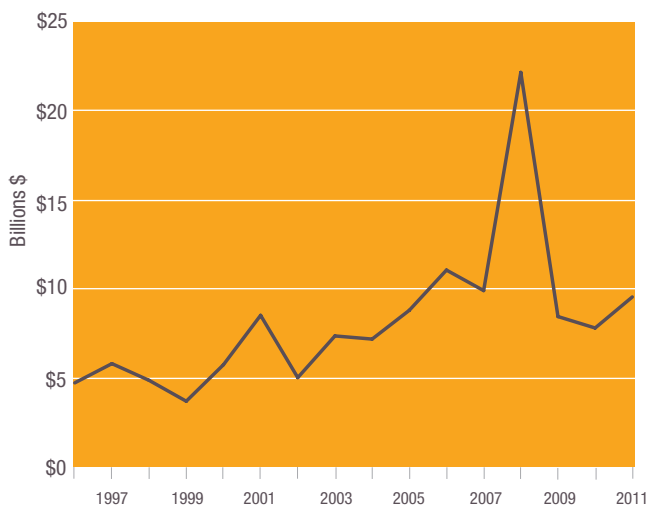
Who Owns Big Oil? Answer: Tens of Millions of Americans



Source: SONECON, "Who Owns Big Oil and Natural Gas Companies," October 2011.

Non-Tax Federal Rent, Royalty and Bonus Revenue*

(1996 – 2011) Total = \$249.9 billion



* From oil and natural gas activities.
Source: U.S. Office of Natural Resources Revenue.

Benefiting Retirees and Public Servants

With more than 97 percent of oil and natural gas company shares owned outside of corporate management, millions of Americans with a retirement fund—including many in the middle class—likely own stock in an oil and natural gas company through mutual funds, pension funds, IRAs and individual accounts. These investments paid \$29 billion in dividends to investors in 2011 alone.²²⁹

Public employees such as firefighters, police officers and teachers with state worker pensions also benefit from a successful oil and natural gas industry. A 2011 Sonecon study found that public pension funds in 17 states were seeing strong returns for teachers, firefighters, police officers and other public pension retirees from those funds' investments in oil and natural gas companies.²³⁰ On average, oil and natural gas stocks comprise 4.6 percent of these state pension fund assets, yet provide 15.7 percent of the returns, spanning years of both vigorous expansion and deep recession.²³¹ The share of the funds' returns attributable to oil and natural gas investments was, on average, 3.4 times greater than their share of the funds' assets.²³²

University endowments across the country also invest in oil and natural gas companies. A 2012 Sonecon study traced university endowments' financial performance from 2001 to 2011 by monitoring their asset allocation and subsequent performance. There was one consistent finding in their results—U.S. shares of oil and natural gas companies outperformed both the overall performance of these endowments and every other asset class examined. The industry's 11.5 percent return between 2001 and 2011 was 326 percent higher than the average annual 10-year return on all U.S. stocks.²³³

Government Revenue

Across the nation, oil and natural gas operators are generating significant local, state and federal tax revenues. In Oklahoma, the production of oil and natural gas provides vital revenue to state and local communities. The tax levied on the industry accounts for 10 percent or more of total state tax collections each year. Over the last three years, the gross production tax has averaged nearly \$1 billion, which helps fund road repairs, support education initiatives and increase general revenue.²³⁴

In North Dakota, oil and natural gas revenue has created a budget surplus of \$1.6 billion as of September 2012, thanks to the \$3.6 billion in revenue provided by industry taxes.²³⁵ That is an impressive \$2,339 for every resident of North Dakota and almost 40 percent of the state's general fund spending.²³⁶ North Dakota state agencies estimate that tax revenues from oil and natural gas operations could rise to \$4.9 billion by 2015.²³⁷

In Pennsylvania, because of development in the Marcellus Shale, more than \$200 million in impact fees were distributed to each of the state's 67 counties in 2012, in addition to the revenue provided to the Fish and Boat Commission, the Transportation Department, the Department of Environmental Protection and other state agencies.²³⁸

Each Alaska citizen received \$878 from the Alaska Permanent Fund Corporation in 2012, which is completely funded by royalties from oil and natural gas production.²³⁹ Because of oil and natural gas development in Alaska, revenue from these resources is expected to provide more than 90 percent of Alaska's unrestricted revenue through 2021.²⁴⁰

These are just a few examples of local communities benefiting from oil and natural gas production. On a larger scale, projected benefits from abundant natural gas supplies and lower prices include almost \$1 trillion in tax and royalty payments to local, state and federal governments over the next 25 years and nearly 3 percent growth of industrial production by 2017.²⁴¹

Community Safety Standard

Public expectations for operators include consideration of the social aspects and consequences of operations, such as treating the environment with respect and being a good neighbor in affected communities. Increasingly, people are demanding more information about industrial activity that takes place near where they live, and an effective regulatory framework is ensuring the industry meets their expectations. Therefore, it is good practice to get broad stakeholder involvement through every phase of project development from entry, through exploration and operation, to eventual decommissioning.

Industry is developing an API guidance document that will describe principles of community engagement to promote the safe and responsible development of our nation's oil and natural gas resources and to demonstrate respect for the communities where industry works and lives. This guidance will be grounded in industry best practices based on real-world experiences of leading companies.

API members adhere to the principles of integrity, transparency and consideration for community concerns and values. As responsible operators, industry recognizes that operations and activities have an impact on local communities. The oil and natural gas industry is committed to managing the social, economic and environmental aspects of its activities, to help communities leverage industry presence to achieve positive and long-lasting benefits, and to be a good neighbor throughout the full project lifecycle.

By the Numbers

30

number of states that have seen oil and natural gas support employment rise by approximately 50 percent in the past decade²⁴²

180,000

gallons of gas and diesel fuel that one company sent to the New Jersey area following Hurricane Sandy to provide fuel and support for the National Guard and the U.S. Postal Service²⁴³

\$2.5 trillion

cumulative amount by 2035 in tax revenues to state and federal treasuries from unconventional oil and natural gas development²⁴⁴

\$926

estimate of the annual savings seen by American families annually due to lower natural gas prices between 2012 and 2015, and could increase to \$2,000 by 2035²⁴⁵

\$200 million

amount paid each year to Pennsylvania landowners in the form of lease payments²⁴⁶

2.8 percent

industry shares owned by corporate management²⁴⁷

\$29 billion

amount of dividends distributed to shareholders in 2011²⁴⁸

\$878

amount each Alaska citizen received in 2012 from the Alaska Permanent Fund Corporation, which is completely funded by royalties from oil and natural gas production²⁴⁹

Oil and Natural Gas: A Community Partner

Oil and natural gas development is powering job and economic growth in local communities across America.

Mount Vernon, Ohio, a town northeast of Columbus with a population of more than 16,000, has benefited from oil and natural gas industry investments. In January 2010, the town had an unemployment rate of more than 11 percent. By September 2012, that rate dropped to 6 percent, well below the national average, thanks to an influx of manufacturing in the area.²⁵⁰

Much of this job growth is due to the increased development of unconventional resources. For example, a Mount Vernon-based manufacturer is experiencing rising demand for the reciprocating gas compressors it manufactures, which are used to produce and transport natural gas from shale.²⁵¹ In nearby Chandlersville, Ohio, locally-owned Annie's Restaurant is serving customers who are drilling new shale gas wells in the area.²⁵²

South Texas has seen similar growth with the development of the Eagle Ford Shale. The Eagle Ford produced less than 1,000 barrels of oil per day in 2009, but averaged nearly 300,000 barrels of oil per day in the first eight months of 2012.²⁵³ The result has been significant job growth in the region. The Eagle Ford Shale has brought 1,932 jobs to McMullen County in south Texas, nearly triple the 2010 census population of less than 700.²⁵⁴

As domestic production of oil and natural gas increases, the United States will need continued investment in refining capacity and with it comes new jobs and opportunities for the communities in which they are located. Refineries employ 14,500 Californians, and for every job in refining, another nine are created through support and service employers.²⁵⁵ In New London, Texas—population 998—plans for a new refinery are slated to bring 300 to 400 construction jobs as part of a two-year project, and 85 high-paying, full-time jobs when the refinery becomes operational.²⁵⁶ The economic impact of the refinery is projected to be around \$8 billion.²⁵⁷

Economic and regulatory pressures have threatened the viability of some refineries, bringing adverse impacts to the communities and states where they operate. A Delaware City, Del., refinery was shut down in 2009 due to the high cost of environmental regulations and ongoing losses, which cost 550 good paying jobs. The governor responded by launching new initiatives that led to the sale of the refinery and provided incentives for modernizations that allowed the new owner to make it viable for years to come. The refinery reopened in 2011.

A refiner in Baytown, Texas, actively supports local schools through grants and special programs, including a partnership with nearby Lee College that resulted in upgraded equipment at the college's science and math departments.²⁵⁸ More than 100 employees from the refinery also volunteer at the Goose Creek and Barbers Hill school districts in Baytown, many as science ambassadors.²⁵⁹

Similarly, in El Segundo, Calif., local residents engage with the leadership team from a nearby refinery to discuss new developments, safety standards, opportunities, and concerns that benefit not only the community, but the refiner as well. Refineries have been and will continue to be a benefit to local communities.

“This is clearly a once-in-a-lifetime event we are witnessing here [in the Eagle Ford Shale].”

— Thomas Tunstall
Research Director, Institute for Economic Development at
University of Texas at San Antonio
October 2012²⁶⁰

But investments in communities are also occurring away from where oil and natural gas exploration and development take place.

In Minnesota and Wisconsin, railways that sat idle for decades are being refurbished to help transport the supplies needed for energy development. Supplies like the sand needed for hydraulic fracturing have led to a boom in the creation of sand mines in Wisconsin.²⁶¹ In fact, about 60 new sand mines are being created in Wisconsin to supply the oil and natural gas industry.²⁶² With the revitalization of railroads in the upper Midwest, manufacturers who faced closure because of a lack of transportation available to bring their products to market are now flourishing.

Increased transport needs have encouraged Union Pacific Railroad to rebuild interchanges in Wisconsin, build a sidetrack in Bricelyn, Minn., and lengthen several tracks at a railroad in Council Bluffs, Iowa, to meet increased demand from unconventional resource extraction.²⁶³ Through this development of local railroads, the region has saved 1,000 jobs.²⁶⁴ Union Pacific Railroad estimates that 2 percent of its business is due to shale plays, helping transport oil extracted and sand needed for the hydraulic fracturing process.²⁶⁵

North Dakota: Energy-Fueled Success

North Dakota is a shining example of the positive impact that oil and natural gas activity has on jobs, the economy and local communities.

In 1999, North Dakota had three oil rigs in operation.²⁶⁶ Since then, energy production growth in the state has been remarkable. In 2011, there were 2,749 wells in North Dakota's side of the Bakken Shale.²⁶⁷ In 2008, the U.S. Geological Survey estimated that the Bakken formation of North Dakota and Montana had up to 4.3 billion barrels of undiscovered technically recoverable oil—25 times the estimate in 1995.²⁶⁸

The Bakken Shale formation in the western part of the state produced about 580,000 barrels of oil per day in May, second only to Texas' 1.7 million barrels per day that month.²⁶⁹ In 2012, North Dakota surpassed California and Alaska in energy production.²⁷⁰ Because of this growth, a refinery in Bismarck-Mandan, N.D., completed a \$35 million expansion in 2012 to help process these resources, enabling the facility to increase capacity by 10,000 barrels per day.²⁷¹

The U.S. Bureau of Economic Analysis (BEA) reported that North Dakota was the fastest growing state in 2011 in terms of real GDP growth.²⁷² Between 2010 and 2011, North Dakota's real GDP growth was a whopping 7.6 percent.²⁷³

Economic growth is also increasing for North Dakota residents. The state's per capita personal income increased 85 percent between 2000 and 2011.²⁷⁴ North Dakota has climbed from 38th in the nation in per capita personal income in 2000 (\$25,592) to seventh in 2011 (\$47,236).²⁷⁵

In late 2011, in Williston County, the unemployment rate was reported to be as little as 1 percent, while the national average hovered around 8 percent.^{276,277} In Williams County, since 2009, the total number of employees on the job has increased by 82 percent with a 49 percent increase in weekly pay.²⁷⁸ In fact, the average salary for a non-service station oil and natural gas employee in North Dakota is more than \$80,000—nearly double the average salary in the state.²⁷⁹

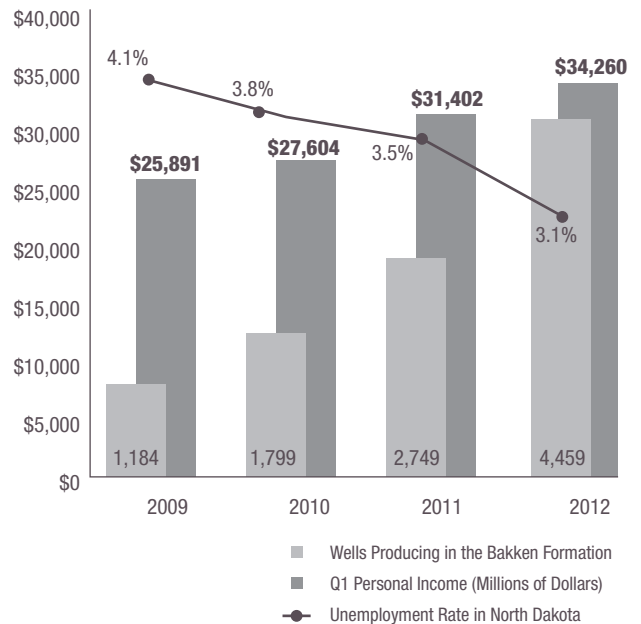
This development is creating jobs for industry workers, leading to economic growth and job creation in other industries for residents.

Vawnita, owner and operator of Best Angus and Quarter Horses, has seen her mineral rights increase in value, providing financial stability for her family.²⁸⁰ Truck driver Terry avoided bankruptcy thanks to the state's oil boom, while Susan came from California with her daughter to open a restaurant in the thriving state.²⁸¹

“Today our state is making enormous contributions to meeting our energy needs and I believe North Dakota will help our nation become energy independent within five to seven years.”

— John Hoeven
U.S. Senator (R–N.D.)
November 2012²⁸²

Q1 Personal Income in North Dakota (Millions)



Source: North Dakota Department of Mineral Resources, "North Dakota Monthly Bakken Oil Production Statistics"; U.S. Bureau of Economic Analysis, "GDP & Personal Income"; U.S. Bureau of Labor Statistics.



Investing in Safety

Investing in Safety

U.S. oil and natural gas companies are committed to protecting the environment, communities and workers' health and safety, with the goal of zero fatalities, zero injuries and zero incidents. The industry has a strong safety record, despite a work environment that often involves heavy equipment, hazardous materials, high temperatures and high pressures.

The industry's workplace safety record reflects its commitment to providing safe and healthy work environments for its employees. In 2011, the rate of job-related injuries and illnesses for the U.S. oil and natural gas industry was lower than that of the rest of the entire U.S. private sector.²⁸³ Any safety or environmental incident is used to learn and to improve technology, training, operational procedures, and industry standards and best practices.

The industry is committed to developing the technologies, standards, best practices and programs needed to help ensure that workplace safety and environmental protection are at the forefront of producing and refining the energy the U.S. needs.

Safety and health goes beyond company boundaries and extends into the communities where the industry operates, as well as the products sold to consumers. By following and constantly improving best practices for safe operations, including training, operational procedures, regulations, industry standards and technology, the industry is meeting this commitment.

Industry Standards

To continually improve best practices for safe operations, API is at the forefront of standards development that reflect proven engineering practices, and works with industry and federal and state governments to develop more than 600 standards and recommended practices, and 250,000 safety documents distributed annually worldwide. API has been recognized as an American National Standards Institute (ANSI) accredited standards developing organization.²⁸⁴ This accreditation requires that API's standards development process meets the ANSI's essential requirements of openness, balance, consensus and due process—and makes key safety documents viewable for free on API's website.

One of API's key standard developments is its Monogram Program, which audits manufacturers of production, drilling and refinery equipment.²⁸⁵ If a manufacturer meets API's strict certification and licensing requirements, it can then display the monogram with its products to represent to its consumers that it meets the highest standards.

In concert with robust standardization and licensing programs and guidelines, API's Worksafe Program certifies oil and natural gas workers are trained to top industry safety

standards. Recognizing the importance of robust safety training, more than 11,800 companies have participated in Worksafe's training and more than 109,000 Worksafe certifications of completion have been issued.²⁸⁶

API also offers the Training Provider Certification Program (TPCP), which confirms that training offered and used in the energy industry meets the highest standards of quality. Using API's Training Program Evaluation Criteria and course-specific requirements, TPCP serves as a third-party certification program to evaluate and certify oil and natural gas industry training courses.²⁸⁷

Employee Safety

From oil rigs to refineries to office cubicles, employee safety is a top priority.

For example, whether it is on an offshore oil rig or at an internal meeting at corporate headquarters, work is not allowed to start without first reviewing emergency and safety procedures. The industry also empowers its employees to individually ensure their workplace is as safe as it can be, encouraging any employee to report unsafe practices or actions. In 2011, the rate of job-related injuries and illnesses for the U.S. oil and natural gas industry was 2.3 per 100 full-time workers, compared to a rate of 3.5 for the entire U.S. private sector.²⁸⁸

Companies invest in ongoing safety training, safety systems and emergency planning, which are continually reviewed and enhanced. The industry also collects safety data for benchmarking surveys through collaboration among companies, which helps provide a consistent, reliable and accurate industry metric for measuring and tracking safety trends in order to promote its continuous improvement.

The industry is committed to developing onshore and offshore technologies, standards, recommended practices and programs needed and necessary to help ensure that workplace safety and environmental protection are at the forefront of producing the energy America needs.

Refining Safety

Refineries are complex facilities that use extensive operating and process standards to ensure safety. As part of the new Advancing Process Safety initiative, API recently launched a new Process Safety Site Assessment program to evaluate higher risk areas of a refinery. Through the use of industry developed protocols, the assessments evaluate both the quality of the written programs and the effectiveness of field implementation. This new program will promote learning through the sharing of experiences and industry proven practices, provide benchmarking opportunities for the sites and serve as a feedback mechanism for the analysis of performance data to identify industry trends and patterns.

Vigorous training is a must in refinery operations, with many companies having measures that go above and beyond industry requirements. Some refiners have a conditional employment clause that states no prospective employee can enter a facility without having completed necessary safety training and passed required tests.²⁸⁹

Another refiner operates a Loss Prevention System, which, along with other safety programs, helps prevent and resolve safety incidents. This has resulted in several refineries receiving achievements for operating 1,000 days or 1 million work hours without incident.²⁹⁰ Yet another example of the industry's safety standards is one refiner's comprehensive industrial hygiene program, which guides employees in handling a multitude of products and substances present or used in the refinery, in the event of an emergency.²⁹¹ Examples abound, the message is clear—safety remains both a priority and a key to successful refinery operations.

Pipeline Safety

The nation's pipeline operators, who deliver crude oil to refineries as well as gasoline, refined petroleum products and natural gas to American consumers daily, are making major investments to enhance pipeline safety.

Oil pipeline operators invested more than \$1 billion on integrity management in 2011, according to an API and Association of Oil Pipe Lines survey, while in 2012 they launched a multi-year, multi-million dollar research effort to improve in-line inspection tools.²⁹² From 1999-2011, the number of spills from onshore liquid petroleum pipelines was reduced by about 60 percent and volumes spilled were reduced by more than 40 percent.²⁹³

Operators monitor tens of thousands of miles of pipelines 365 days a year via technology such as advanced supervisory control and data acquisition systems. These systems are operated by highly-trained controllers that meet requirements set by the U.S. Department of Transportation. In pipeline control rooms across the United States, employees using high-tech computers monitor flow rates, pressures, pump operating statuses and valve positions. Controllers can shut down a pipeline section within minutes, if necessary.

Recent industry standards and safety regulations have been put in place over the last two years to increase safety in pipeline control rooms. Some of the measures include:

- Implementing fatigue mitigation measures for controllers like high-tech lighting systems and adjustable work consoles.²⁹⁴
- Managing to reduce distractions and work load, decreasing the incidence of false alarms.²⁹⁵
- Validation of sensors along pipelines to ensure controllers can see real-time activity.²⁹⁶

The industry maintains high-operating standards and comprehensive maintenance programs to transport millions of barrels of crude oil safely and efficiently to end destinations. Inspections are routinely completed to prioritize any needed maintenance to preempt any issues that may arise across the pipeline network.

Across the country, the industry makes every effort to inform the public of pipeline safety. Industry companies hold regular training exercises for employees throughout the year to keep necessary skills sharp. API has begun work on a recommended practice for Pipeline Safety Management Systems that will guide operators in the use of systems to ensure that the practices and procedures to make pipelines safe are in place and being used across the industry.

Offshore Safety

In 2011, the industry launched the Center for Offshore Safety, a program that drives safety improvements for companies that operate offshore. The Center's mission is to promote the highest level of safety in offshore operations. It draws on lessons learned around the world and Center for Offshore Safety members' safety management systems are reviewed and certified by independent third-party auditors.

The Center serves the offshore industry with the purpose of adopting standards of excellence to ensure continuous improvement in safety and offshore operational integrity.

The oil and natural gas industry has invested heavily in deployable deepwater response vessels and equipment capable of capping and stopping the flow of oil. More than 100 offshore API Technical Standards have been incorporated into federal regulations and cited more than 350 times.²⁹⁷ API recently updated its blowout prevention equipment standard, and will continue to develop, publish and promote diverse standards to enhance offshore safety.

Prevention of an accident is key and the industry continues to invest in the tools to ensure that any potential spill is stopped, cleaned up and remediated. Ongoing industry research initiatives focus on collaboration between private and public stakeholders, successful incorporation of lessons learned, and the development of cooperative mechanisms for effective oil spill response and recovery efforts. The industry has also greatly increased its physical capabilities for responding to any potential future spill, including increased vessels and equipment for spill response efforts.

In order to secure its operations and safeguard employees and local communities, the oil and natural gas industry vigorously plans and prepares for inclement weather like hurricanes. As a majority of production sites are often in harm's way, operators have significant safety measures and procedures in place before every hurricane season.

In advance of a tropical storm or hurricane near offshore operations, companies will assess the situation and evacuate personnel and relocate drillships to a safe location if necessary.²⁹⁸ After a storm, operators conduct flyovers of offshore facilities to evaluate damage from the air. Once safety on-site has been confirmed, operators send assessment crews to offshore facilities to physically survey the damage. Throughout the year, operators test and restock emergency equipment and continuously train personnel to make sure every employee is prepared to handle inclement weather.

Onshore Safety

Onshore, the industry has a number of programs designed to enhance worker safety and prevent spills. The industry follows and constantly improves best practices for safe operations, which include training, operational procedures, regulatory compliance, industry standards and technology.

The industry has helped create more than 235 exploration and production standards for onshore and offshore energy development and also works closely with local, state and federal regulators to ensure a strong focus on safety.²⁹⁹ In addition, the API Worksafe Program provides training on important safety issues at onshore sites.³⁰⁰

When undertaking a new project, the oil and natural gas industry works to engage stakeholders to gain a clear understanding of the environmental considerations of an area. They then create a balanced plan to protect the locations in which they operate and apply the industry recommended practices. Companies strongly support the Occupational Safety and Health Administration's voluntary protection program, which distinguishes work sites that achieve exemplary occupational safety and health standards. Companies coordinate the activities of contract workers to make them aware of safe work practices, so that facilities onshore run safely and smoothly with employees on-site.³⁰¹

Product Stewardship

Across the industry, oil and natural gas companies are committed to the environmental, health and safety performance of all services and products throughout the energy supply chain. For example, API administers the Petroleum High Production Volume Group, which consists of 60 companies representing 92 percent of the nation's refinery capacity.³⁰² The group was formed in response to the EPA's High Production Volume (HPV) Challenge Program, which challenged companies to make health and environmental effects data publicly available on chemicals produced or imported in the United States in the greatest quantities.³⁰³ The Petroleum HPV Group voluntarily discloses chemicals used or manufactured by the industry and works in conjunction with the EPA, other trade associations, and non-government organizations to meet the HPV challenge, using the best scientific means available.

Oil and natural gas companies are focused on product and service integrity in terms of health, safety and environmental performance. For instance, one company is implementing the United Nation's Globally Harmonized System (GHS) for classification and labeling of chemicals in the United States to provide clearer communication for any product with hazardous materials. Per GHS mandate, the company provides consistent warning phrases and symbols on product labels.³⁰⁴ Another company trains customers in the handling and emergency response requirements related to its products, such as providing training videos and helping local authorities run emergency response exercises.³⁰⁵

In addition, the industry works with universities and federal and state governments to identify and undertake research addressing fuel release issues for retail gasoline stations, terminals, pipelines and refineries providing companies and regulators with risk-based corrective action solutions.

By the Numbers:

235

API onshore exploration and production standards that support safe operations³⁰⁶

158

standards elevating the safety performance of the entire refining sector³⁰⁷

More than 30,000

well sites that have disclosed chemicals used for hydraulic fracturing on FracFocus³⁰⁸

More than \$1 billion

amount spent on pipeline integrity management in 2011³⁰⁹

More than 100

number of offshore API Technical Standards incorporated into federal regulations and cited more than 350 times³¹⁰

More than 1 million

number of wells that have used hydraulic fracturing, without one case of groundwater contamination³¹¹



Policy Perspective

Policy Perspective

A November 2012 poll found that 73 percent of voters support increased oil and natural gas development.³¹²

A full 91 percent agreed that increased domestic oil and natural gas development would lead to job creation and 86 percent recognized it could lower energy prices for consumers.³¹³

Several recent reports are projecting that the U.S. can be energy self-sufficient in as little as a dozen years. But the right policies must be in place to realize this incredible opportunity. While American voters see the importance of increased domestic energy production, many promising U.S. areas, such as more than 85 percent of federal offshore areas, remain off-limits—despite strong majority support for increased offshore oil and natural gas production.^{314,315}

Increased access to U.S. oil and natural gas resources could create 1 million new jobs in the next 10 years alone.³¹⁶ At a time when policymakers are looking for ways to jumpstart the American economy and provide steady, good-paying jobs for the more than 12 million unemployed Americans, these opportunities for growth across the country can become reality with commonsense government policies.³¹⁷

But policies are also hindering growth. New York implemented a state-wide hydraulic fracturing moratorium in 2008, restricting the potential for new jobs and economic activity that would be created from accessing its shale energy resources. If New York allowed such energy development, the state could see 32,241 additional jobs created by 2015 and 47,817 additional jobs created by 2020.³¹⁸ This development would result in an average of \$211 million in new revenue generated by the industry directly to the state every year through 2030.³¹⁹ That's nearly three times as much as New York will spend on state-wide higher education as part of its 2011-2012 budget.³²⁰

In addition, opportunities off the coast of Virginia are on hold despite bipartisan support. A Republican Governor and Democratic Senators have advocated for development of oil and natural gas off their state's coast, directly requesting the U.S. Secretary of Interior allow such development, and the two Senators cosponsored legislation directing the administration to include Virginia in its five-year leasing plan to expand offshore production.^{321,322} Studies show that such production will create thousands of jobs while growing the economy and generate significant government revenue.

The refining sector, meanwhile, already operates in an extremely complex regulatory environment. If America's refining sector is to remain viable, we need a regulatory structure that improves our environment while allowing the industry to remain competitive in the global marketplace. We cannot underestimate the significance of our domestic refining sector to our economy at large, as well as to national security. In addition to supporting 540,000 good-paying jobs, each year the refining sector generates billions in government revenue through income, sales, use and property taxes. Refiners have made significant investments to improve their efficiency and to develop and produce clean transportation fuels and a reasonable, predictable regulatory environment is critical to continuing that progress.

The oil and natural gas industry is investing in America through safe and reliable domestic energy production and world-class refineries. The industry stands ready to continue and increase its investments in energy, communities, workers, technology and safety, but it requires commonsense policies that provide certainty and encourage such investments. With U.S. energy demand for oil expected to grow between now and 2040, ensuring access to America's energy resources is critical to meeting future demand.³²³

API recommends the following policies to ensure the oil and natural gas industry's continued investments in America.

- Increase Access to Federal Lands for Safe and Responsible Energy Production
- Streamline the Leasing and Permitting Process
- Support our Refining Sector by Avoiding Unnecessary Regulatory Burdens
- Approve Pipeline Infrastructure Projects, such as Keystone XL
- Avoid Discouraging Investment through Punitive New Energy Taxes
- Avoid Unworkable Mandates for Renewable Fuels
- Include Oil and Natural Gas in Efforts to Improve our Nation's Balance of Trade



Conclusion:
Return on Investment—
Energy for America's Future

Conclusion: Return on Investment— Energy for America's Future

A strong domestic oil and natural gas industry is fundamental to the success of the United States. Investments by the oil and natural gas industry serve as the first step to producing and delivering affordable and reliable energy, fuels and refined products that are critical components for U.S. business success and economic growth. In turn, economic growth creates jobs across the country and provides for our national security.

The industry has long provided significant return to Americans through the development of innovative technologies, advancements in environmental stewardship and a significant return on investment to governments through revenues and tax payments. Through greater development of domestic oil and natural gas resources and maintenance of a strong refining sector, the industry can continue to provide a level of investment that will lead to expanded economic growth and further environmental and technological innovations.

On average, for every direct job created in the oil, natural gas and related industries, three or more indirect and induced jobs are also created across the economy, further emphasizing the benefit of increased investment by the industry to the American economy.³²⁴

The growth in domestic oil and natural gas production is accompanied by investments by the U.S. refining sector. Growing domestic sources of lighter crude oil, when coupled with heavier oil from Canadian oil sands, will provide stable sources of crude oil to U.S. refineries. In addition, refiners use natural gas for power and as a feedstock, so growing domestic natural gas supplies can keep U.S. refiners competitive globally. Combined, production and refining aid America's economic recovery by spurring a resurgence of manufacturing in the United States, from the development of the equipment needed to extract these resources and through reliable and affordable sources of natural gas, which are a key part of the equation for many manufacturers and a feedstock for large industrial natural gas users.

Industry investments are also providing a direct return for consumers, who are benefiting from lower costs to heat and power their homes. IHS Global Insight estimates American families saved nearly \$1,000 on average in 2012 through lower energy costs and could realize as much as \$2,000 in annual energy savings per household by 2035.³²⁵

A future of abundant domestic energy is already arriving through today's oil and natural gas industry investments in cutting-edge technologies to access resources previously thought unreachable. With unconventional resources soon expected to produce the majority of America's energy, these resources will soon become conventional. Shale energy development is a game changer for communities, the economy and even the environment, as increased use of natural gas has helped reduce CO₂ emissions to 1992 levels.³²⁶

Thanks to vast U.S. energy resources and a world-class refining sector, the oil and natural gas industry stands ready to continue the investments made in jobs, communities, technology, the environment and safety, while improving America's energy security.

We are investing in America's future.



Bettina

Environmental, Health and Safety Technician

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