



the state of
**American
Energy**

AMERICA'S ENERGY, AMERICA'S CHOICE

The American Petroleum Institute

The American Petroleum Institute (API) is a national trade association that represents all segments of America's technology-driven oil and natural gas industry. Its more than 550 members—including large integrated companies, exploration and production, refining, marketing, pipeline, and marine businesses, and service and supply firms—provide most of the nation's energy and are backed by a growing grassroots movement of over 15 million Americans. The industry also supports 9.8 million U.S. jobs and 8 percent of the U.S. economy, delivers \$85 million a day in revenue to our government, and, since 2000, has invested more than \$2 trillion in U.S. capital projects to advance all forms of energy, including alternatives.



From the President and CEO

America is experiencing an energy revival. We are now defined by an abundance of energy resources rather than a scarcity of them. This affords us the opportunity to think in terms of promise and potential.

While the strength of the industry is something from which America can gain confidence, particularly against the current backdrop of economic uncertainty, to realize our nation's full potential, America must choose a course that allows the industry to continue to grow. America possesses vast domestic oil and natural gas resources, and must commit to their full production; to refining these resources within the U.S.; and to building the facilities and infrastructure necessary to bring these resources to consumers in the U.S. and around the globe.

API's 2014 State of American Energy provides the oil and natural gas industry's perspective on policies and issues impacting America's energy future. The right public policies can fuel America's economic revival and improve our energy security for future generations through the safe and responsible production, refining, and transportation of our country's oil and natural gas resources. We are committed to working with communities and policymakers to make these wise choices.

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: AMERICA'S
ENERGY, AMERICA'S CHOICE

America's Energy, America's Choice

America is in the midst of an energy renaissance that has the power to be transformative. Innovations have yielded access to new energy resources that have caused a ripple effect throughout the industry and hold the potential to dramatically and positively impact our economy and role on the world's energy stage.

For more than 100 years, the U.S. oil and natural gas industry has been a durable thread in the fabric of America, providing consumers with energy for the necessities and conveniences that are a part of their daily lives, from the fuels that power their vehicles and heat their homes, to the clothes, plastics, and other petroleum-based products that they use each day.

Today, the industry is providing a strong foundation for the economy as it seeks a sustained recovery in the wake of the recession.¹ Affordable energy is not only enabling U.S. manufacturers to reopen their doors and, according to Standard and Poor's, giving them "a competitive edge over overseas competitors,"² it is also relieving financial burdens on families that are struggling to make ends meet.³ And, at a time when job creation is most needed, the industry is supporting millions of jobs across the nation.⁴

America also finds itself on the cusp of energy self-sufficiency and security through reliable, affordable, and abundant supplies of domestic oil and natural gas that can sustain and empower us well into the foreseeable future. In fact, the U.S. is already the global leader in oil and natural gas production⁵ and together with Canadian energy supplies could produce more than 100 percent of its liquid fuel needs by 2024.⁶

But now we are at a critical point, one that will define our path forward. If we are to realize this bright new energy future, America must make the right decisions today by deliberately choosing to take even greater advantage of our domestic oil and natural gas resources, choosing to ensure our ability to refine these resources within the U.S., and choosing to commit ourselves to continuing to build the world-class facilities and infrastructure necessary to bring these products to consumers in the U.S. and around the globe.

America must make the right decisions today by deliberately choosing to take even greater advantage of our domestic oil and natural gas resources

This report highlights how America can choose a future where the oil and natural gas industry continues to contribute to our nation's economic recovery and job creation; to develop and utilize state-of-the-art technologies to safely discover, extract, refine, and transport oil and natural gas; and to enable the U.S. to become a global energy superpower.



CHOOSING A STRONGER
ECONOMY AND JOB GROWTH

Choosing a Stronger Economy and Job Growth

When America's energy industry thrives, our country thrives. Energy growth equals economic growth.

Data continue to tell this story and demonstrate the industry's fundamental role in the U.S. economy. The industry is a major investor in the public and private sectors, supporting \$1.2 trillion in U.S. Gross Domestic Product (GDP) in 2011.⁷ It supports roughly 8 percent of the entire U.S. economy, up from 7.7 percent just two years prior, according to an analysis from PwC US.⁸

And while national unemployment levels have been high, the oil and natural gas industry has been a significant job creator in communities across the nation, supporting 9.8 million jobs accounting for 5.6 percent of total U.S. employment.⁹

Strengthening the Economy

The oil and natural gas industry touches every facet of our lives—our homes, the businesses in which we work, the goods we purchase, and the communities where we live—sometimes in ways that may not immediately jump to mind.

Families that are struggling to pay their bills have more of their income available for other priorities thanks to unconventional resource development, which has lowered natural gas costs and increased disposable incomes by more than \$1,200 per household.¹⁰ Likewise, at a time when elected officials are searching for funding to finance important public priorities, the oil and natural gas industry is providing \$85 million a day to government in the form of royalties, bonuses paid at lease sales, and taxes.¹¹

On the business side, U.S. oil and natural gas companies are reinvigorating industries that have struggled through

the recession by providing affordable energy and chemical feedstocks that can reduce operating and material costs throughout the value chain, which, in turn, increases available capital, creates additional jobs, and allows companies to become more competitive with their international counterparts.¹²

In fact, U.S. manufacturers, many of which went into decline following the 2009 recession, are beginning to experience a revival due to increased affordable natural gas supplies. These manufacturers, particularly those in energy-intensive industries, such as chemicals, aluminum, glass, cement, and food, are realizing a competitive advantage globally and are expected to expand operations thanks to unconventional oil and natural gas activity.¹³ Lower natural gas prices are predicted to increase industrial output by 2.8 percent by 2015 and by 3.9 percent by 2025,¹⁴ according to economic consulting firm IHS.

Numerous independent analyses predict a new energy future for our country in which the oil and natural gas industry could be responsible for even more economic stimulus, and with it even greater job creation

In our own industry, we are creating opportunities for numerous suppliers, from large manufacturers to small businesses, to provide many goods and services, whether in the form of drill rigs that produce energy on land and beneath the sea, or steel for pipelines that carry oil to refineries, or complex computer software that monitors the transport of natural gas through pipelines, to name just a few.



\$1,200

AVERAGE AMOUNT FAMILIES' DISPOSABLE INCOMES INCREASED IN 2012 DUE TO LOWER NATURAL GAS COSTS FROM UNCONVENTIONAL DEVELOPMENT



529,000

NUMBER OF U.S. JOBS SUPPORTED BY AMERICA'S REFINING INDUSTRY

These contributions made by the oil and natural gas industry to America's economy are significant, to be sure, but they have the potential to be even greater. Numerous independent analyses predict a new energy future for our country in which the oil and natural gas industry could be responsible for even more economic stimulus, and with it even greater job creation.^{15,16} This new energy future can only become reality if America elects to take greater advantage of our domestic oil and natural gas resources, and supports the necessary infrastructure to refine and transport these resources to market.

States Benefit Today and in the Future

The oil and natural gas industry is lifting the economic fortunes of states and communities across America. America's refining industry, in particular, has been an important contributor to the economic well-being of communities, supporting roughly 529,000¹⁷ U.S. jobs. Jobs directly related to the refining industry have an average annual income of \$111,542.¹⁸

The increased availability of lower-cost domestic oil is causing a dramatic rebound among refineries and communities located in East Coast states. Refineries in this region that once were contemplating closing are now roaring back to life. One such refinery in Philadelphia, Pennsylvania—through a joint venture between Sunoco and private equity firm The Carlyle Group—is expanding operations, which will not only save 850 jobs at the refinery, but also create nearly 200 new permanent positions at the facility.¹⁹

While states such as Texas, Louisiana, Pennsylvania, and North Dakota are well-known either for the oil and natural gas revolution within their borders or for their role as important centers of refining, many other states in different regions of the country are reaping the benefits of oil and natural gas development, too.

Pennsylvania's western neighbor, Ohio, is seeing a significant increase in statewide employment as a result of unconventional shale oil and natural gas development. In 2012 alone, more than 38,000 Ohio jobs were supported by unconventional oil and natural gas activity.²⁰ These oil and natural gas jobs also paid significantly more than other jobs throughout Ohio that year. While the average annual wage in Ohio was nearly \$55,000 in 2012, the average wage of direct jobs in unconventional natural gas activity was \$81,000.²¹

CHOOSING TO PROTECT THE ENVIRONMENT

Promoting Environmental Sustainability in Communities



While the industry is pioneering the use of energy innovations to unlock America's oil and natural gas resources, many of our companies are also delivering renewable energy and efficiency solutions that contribute to the sustainability of communities.

Chevron Energy Solutions recently completed renewable energy projects designed to reduce energy use and costs in two California communities. In Santa Cruz, Chevron installed solar panels and made lighting efficiency upgrades at six schools, saving the district nearly \$2.5 million over the life of the project.²² In Patterson, Chevron's efficiency improvements will save \$6 million, and the company is training high school students as energy auditors.²³

“ IT'S THE FIRST TIME WE'VE BEEN UNDER 10 PERCENT UNEMPLOYMENT IN, GOSH, SEVERAL YEARS. ”

— Tom Wheaton, Carroll County Commissioner, Eastern Ohio



\$4.1
BILLION

ADDED ECONOMIC ACTIVITY DUE TO OIL AND NATURAL GAS DEVELOPMENT IN THE STATE OF OHIO IN 2012

SECTION 1: Choosing a Stronger Economy and Job Growth

Oil and natural gas development in Ohio has provided the state with a sizable economic boost, adding \$4.1 billion in economic activity in 2012.²⁴ It's a boost that hasn't gone unnoticed by local business owners and elected officials. In Carroll County, located in eastern Ohio, one restaurant owner commented on the surge in business resulting from oil and natural gas development, saying, "People started coming into town, and we started hearing about shale. I would say we've seen a 30 percent increase in business over the last year."²⁵ And Tom Wheaton, Carroll County Commissioner, commented, "It's the first time we've been under 10 percent unemployment in, gosh, several years."²⁶

In Colorado, oil and natural gas development is having a similar positive impact, particularly in rural areas with a scarcity of high-paying jobs.²⁷ According to a recent study by the University of Colorado, Colorado's direct employment in the oil and natural gas industry was more than 51,000 in 2012 with annual wages averaging nearly \$75,000, which is about 50 percent higher than the average wage for all industries across the state.²⁸

Likewise, development of the Fayetteville Shale in Arkansas has generated thousands of jobs and added billions of dollars to the state's economy. New jobs in mining, quarrying, and the state's oil and natural gas extraction industries accounted for 65 percent of Arkansas' employment growth between 2001 and 2010.²⁹ During the three-year period between 2008 and 2011, Fayetteville Shale activities contributed \$18.5 billion in economic activity to Arkansas.³⁰

Similarly, while the oil and natural gas industry currently supports 6.7 percent of California's economy and more than 793,000 total jobs in the state,³¹ the industry's economic impact could be much greater. A study conducted by the University of Southern California in 2013 found that developing oil from the Monterey Shale deposit could create as many as 2.8 million new jobs in California.³²

Oil and natural gas development can even be an important benefit to communities that rely on outdoor recreation such as skiing, hunting, fishing, and hiking; in fact, throughout the Western states, energy extraction and outdoor amenities both have integral roles in counties' economic growth and development.³³ Not only can oil and natural gas production in these communities stimulate growth in areas that support outdoor recreation, it can also create jobs alongside employment in recreation industries.³⁴

Providing Revenue to Government

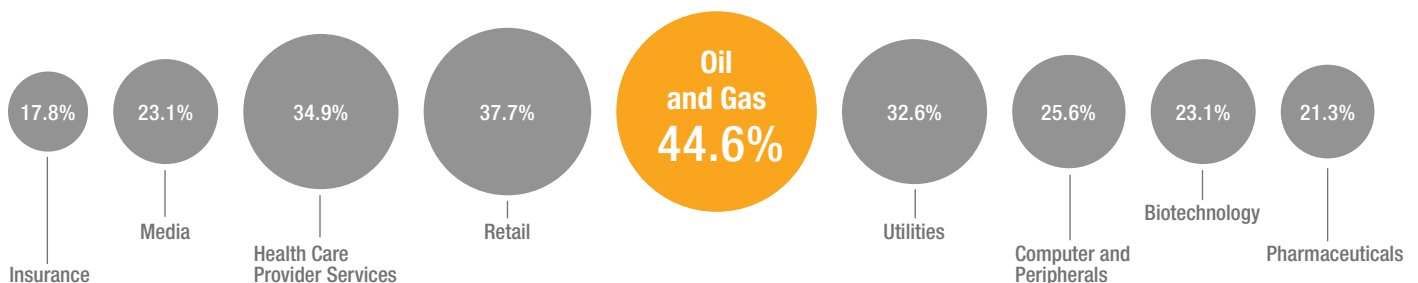
During a time when federal and state treasuries alike seek much-needed revenue, the oil and natural gas industry is a considerable source of income to government.³⁵ At the federal level, the industry is a reliable revenue stream, paying about \$85 million every day to the U.S. Treasury in federal income taxes, royalty payments, and other fees.³⁶

Revenue provided by the industry is particularly beneficial to states and local communities, where it helps to fund important programs and projects that, in turn, add to local economic activity. In Pennsylvania, the industry paid more than \$400 million into the state's Unconventional Gas Well Fund between 2012 and 2013, which has been used for local housing initiatives, highway and bridge improvements, and environmental programs.³⁷

The oil and natural gas revolution in Texas has led to significant industry revenues for the state, even outpacing initial projections by state officials. By August 2013, anticipated oil and natural gas industry tax revenues had already exceeded Texas' projections by \$900 million during the first nine months of the state's fiscal year.³⁸

EFFECTIVE TAX RATES AMONG INDUSTRIES

(averaged over 2007-2012)



Tax rate is total income taxes, which include income taxes imposed by federal, state, and foreign governments, divided by pretax income. Source: S&P Research Insight; S&P 1500 by GICS Industry Code.

These payments enabled the state legislature to fund important highway construction and maintenance, and other infrastructure projects.³⁹

The oil and natural gas industry also contributed substantially to Colorado's state treasury, paying nearly \$1.6 billion to the state in 2012. Roughly \$1 billion of that amount originated directly from state severance taxes, public leases, property taxes, and public royalties.⁴⁰ Payments and investments made by the industry are clearly visible to local officials:

“[Energy companies] invest back in our community. They support the schools, they support our historical society, they support the food bank, the cancer society here in Weld County ... The list just goes on how they invest back into the community.”⁴¹

— Barbara Kirkmeyer, Weld County Commissioner, Colorado

A Jobs Engine

The oil and natural gas industry provides millions of Americans with well-paying jobs, but these employment opportunities don't simply include highly skilled direct positions within the industry itself. For each oil and natural gas industry job created, an additional three jobs are created in other sectors of the economy.⁴²

Numerous indirect jobs are supported by the oil and natural gas industry at companies across the country that provide materials or services that enable the production, refining, and transport of oil and natural gas. These indirect jobs include positions in the manufacturing sector such as steel and compressor production as well as jobs in the trucking and food service industries, to name a few.

Also, personal spending by industry employees, whether they are drilling wells or building new pipelines in towns where they work, is a powerful creator of induced jobs, leading to local employment opportunities with restaurants, hotels, and even movie theaters. For example, America's refining industry alone supports roughly 422,000 indirect and induced jobs across the economy.⁴³

When vast swaths of the U.S. economy were shedding jobs during the recession, employment growth in oil and natural

gas industry professions was one of the bright spots in the economy. According to two reports from the consulting firm PwC US, direct employment in oil and natural gas extraction grew by more than 300,000 from 2009 to 2011, a 64 percent increase. Support jobs for oil and natural gas operations also increased, adding over 43,000 positions, a more than 19 percent increase.⁴⁴ By way of contrast, during the same period, the U.S. economy lost 1.1 million non-farm jobs between January 2009 and December 2011, according to the Bureau of Labor Statistics (BLS).⁴⁵

If America supports greater use of our oil and natural gas resources, the industry and all sectors associated with it across the economy could experience even more job growth. A study by economic consulting firm Wood Mackenzie found that nearly 1.4 million new jobs could be created through policies that support increased oil and natural gas development and required infrastructure. Increasing access to federal areas in the Gulf of Mexico could create 100,000 new jobs in Florida alone in five years.⁴⁶ America's manufacturing industry will continue to reap the benefits, as well. Expanded shale oil and natural gas production could support 400,000 new manufacturing jobs by 2015.⁴⁷

The chemical industry is one sector, in particular, that expects to see job growth due to increased supplies of natural gas. One recent report from the American Chemistry Council (ACC) examined the likely economic benefits of nearly 100 chemical industry projects totaling approximately \$72 billion in potential new U.S. investment. The report found this new investment could lead to 46,000 direct jobs in the chemical industry and another 264,000 jobs in supplier industries.⁴⁸

“The United States has become a magnet for chemical industry investment, a testament to the favorable environment created by America's shale gas as well as a vote of confidence in a bright natural gas outlook for decades to come. What's especially exciting is that half of the announced investments are from firms based outside the U.S., which means our country is poised to capture market share from the rest of the world.”⁴⁹

— Cal Dooley, ACC President and CEO

More than Just a Job, a Career

When U.S. workers look at employment opportunities in the oil and natural gas industry, they see the potential to enter a profession characterized by higher than average wages, a variety of fields in which to specialize, and a commitment to diversity.

The industry supports careers in numerous fields, from mechanic to geophysicist, electrician to soil scientist, and rig equipment operator to petroleum engineer. While the industry offers job opportunities in such highly specialized areas as botanist and marine biologist,⁵⁰ equally essential are blue-collar positions such as truck drivers and machinists. A wide variety of jobs exist within the industry, and all of them play an important role in meeting our consumers' energy needs.

Wages paid by the industry in exploration and production activities, on average, are more than double the national average annual wage across all industries.⁵¹ In Alaska, for example, average annual pay for a worker in the extraction industry was more than \$127,000 in 2012.⁵² And in North Dakota, the average annual pay was nearly \$86,000 in 2012⁵³ for jobs associated with exploration and production of oil and natural gas.

The oil and natural gas industry is becoming a career choice for more women and minorities. According to BLS, women filled nearly one-third of the jobs added in the upstream oil and natural gas segment during the first quarter of 2013.⁵⁴ In fact, more than 78,000 women worked directly in oil and natural gas fields in 2011—an increase of more than 60 percent since 2004.⁵⁵

Communities where oil and natural gas development is occurring also offer opportunities for women entrepreneurs. Kathy Neset, president of Neset Consulting Service, started her business of 180 employees in North Dakota in 1981 to assist oil companies with horizontal drilling activities in the state. According to Neset, “There are great opportunities for good-paying professional jobs such as geologists, engineers, and surveyors.”⁵⁶

Opportunities in the industry abound for African Americans and Hispanics, as well. If elected leaders choose policies that accelerate oil and natural gas development, more than 166,000 jobs created in the upstream industry alone are predicted to be held by African American and Hispanic workers over the period 2010-2020, and they would hold more than 285,000 new upstream jobs by 2030.⁵⁷ While many of these new jobs are expected to be at the scientific and managerial levels, roughly 80 percent could be blue-collar jobs, providing employment opportunities and good wages for workers without four-year degrees.⁵⁸

Looking to the future, employment opportunities in the industry will grow as the baby boomer generation of workers in the industry begins to retire. This large demographic shift, referred to in the industry as the “Great Crew Change,” could see up to 50 percent of the oil and natural gas industry’s skilled workers retire within the next five to seven years.⁵⁹ As this begins to occur, more and more young workers will have opportunities to begin fulfilling careers in the industry.

WITH THE RIGHT POLICIES MORE THAN

166,000

JOBS IN THE UPSTREAM INDUSTRY ALONE ARE PREDICTED TO BE HELD BY AFRICAN AMERICAN AND HISPANIC WORKERS OVER THE 2010-2020 PERIOD



78,000

NUMBER OF WOMEN WHO WORKED DIRECTLY IN OIL AND NATURAL GAS FIELDS IN 2011—MORE THAN A 60 PERCENT INCREASE SINCE 2004

“THERE ARE GREAT OPPORTUNITIES FOR GOOD-PAYING PROFESSIONAL JOBS.”

— Kathy Neset, President of Neset Consulting Service, North Dakota



America's refining industry has reliably met the needs of consumers and manufacturers who depend on the clean fuels and diverse petrochemicals the industry produces. But to meet our future energy needs, America's refineries will need the capacity to process not just increasing U.S. oil resources, but oil from Canada's vast oil sands, as well.

America's refineries play a vital role in producing raw materials used to make paint for homes and buildings, textiles for clothing and carpets, foam for bedding and furniture, medicines to make us well, and plastics for countless items we use each day

The U.S. has the potential to be an energy superpower that is not only energy self-sufficient,⁶⁰ but also a net exporter of refined petroleum products to markets outside the U.S. For this to occur, policymakers must ensure our ability to refine oil resources within the U.S. and not encumber the refining sector with layers of unnecessary, burdensome, duplicative and potentially costly regulations.

Refineries Fuel America's Energy Needs and Economy

The U.S. refining industry is the most technologically advanced in the world, having spent more than \$28 billion between 2008 and 2010 alone on capital expenditures to improve refining facilities.⁶¹ Industry advancements have significantly increased refining capacity, adding the equivalent of 20 new average-sized facilities to existing refinery capacity since 1976.⁶² Today, 143 U.S. refineries⁶³ convert an average of 15 million barrels of crude oil each day⁶⁴ into high-quality gasoline, low-sulfur diesel, heating oil, jet fuel, petrochemical feedstocks, and other important petroleum products.

While U.S. refineries produce more than 93 percent of all the gasoline used in America today, enough to power 246 million vehicles,⁶⁵ the industry also manufactures materials that are the building blocks for many products few people would associate with oil. America's refineries play a vital role in producing raw materials used to make paint for homes and buildings, textiles for clothing and carpets, foam for bedding and furniture, medicines to make us well, and plastics for countless items we use each day.⁶⁶

In 2011, the refining industry contributed more than \$289 billion to U.S. GDP.⁶⁷ If America chooses to take advantage of the potential that lies within its many oil and natural gas resources—and policymakers provide a regulatory framework that offers certainty to refiners without harming U.S. competitiveness—the refining industry's contributions to our economy and the global marketplace could be even more significant.

The U.S. Could Be a “Refiner to the World”⁶⁸

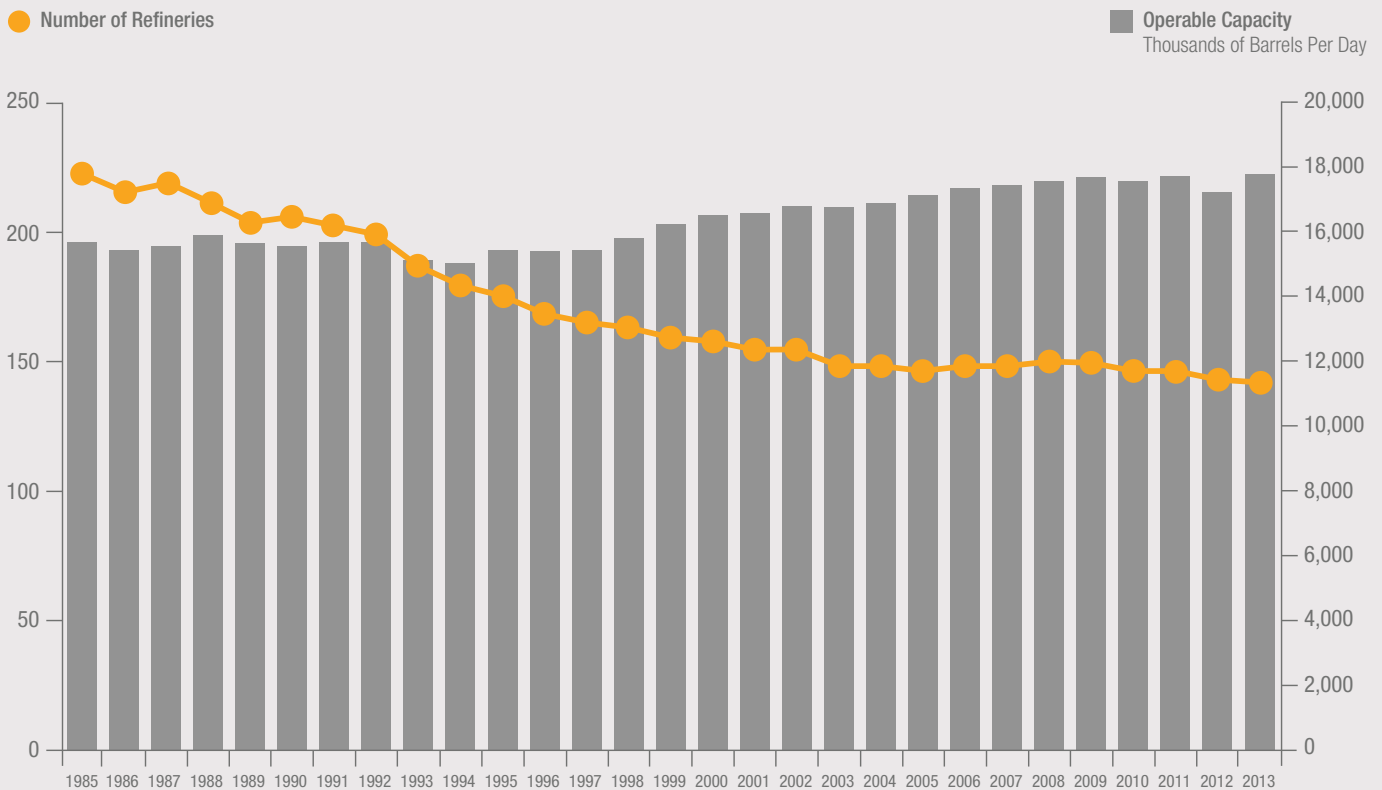
America’s robust refining sector stands in stark contrast to many of its global competitors. While 15 refineries in Europe have closed since 2008, eliminating roughly 8 percent of that continent’s refining capacity,⁶⁹ U.S. refining capacity has increased nearly 230,000 barrels of oil per day from 2008 to 2013.⁷⁰ U.S. refineries today are operating at more than 90 percent capacity.⁷¹ Thanks to innovations that are permitting unprecedented oil and natural gas development in America, the industry is even exporting fuels to other global markets while meeting U.S. demand. In 2012, the U.S. exported an average of more than 1 million barrels of fuel per day.⁷²

As overseas demand for low-sulfur diesel fuels increases dramatically,⁷³ America’s refining sector is uniquely positioned to supply it. Global demand for diesel fuel is increasing two times as fast as gasoline.⁷⁴ Unlike in Latin America and Europe, where existing refineries are unable to produce sufficient diesel to meet demand,^{75,76} American refineries are able to export diesel that will not be consumed domestically.

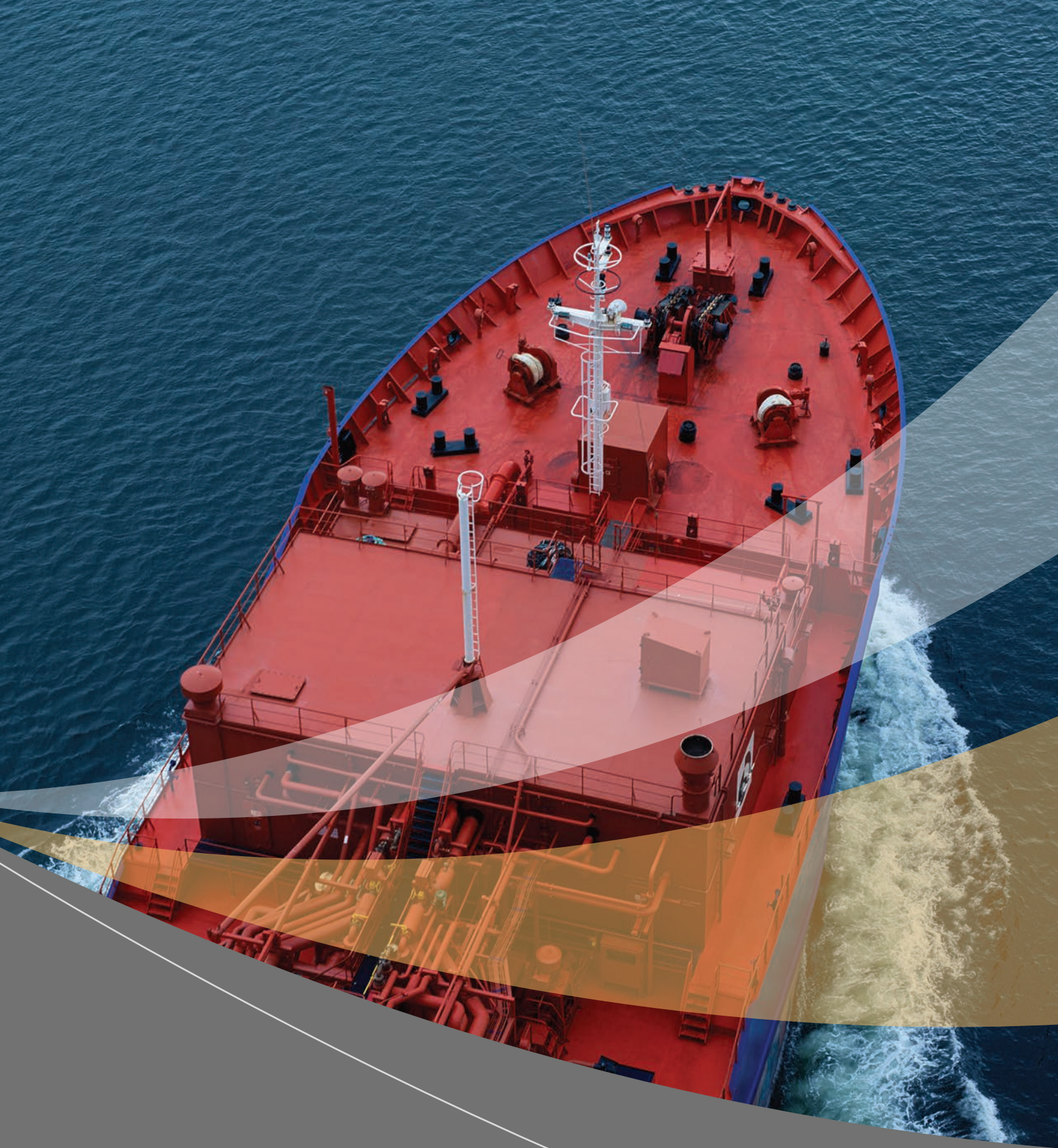
Maintaining a strong domestic refining industry is vital if America is to reach its potential as an energy superpower. But this cannot happen if U.S. refiners face a regulatory structure that does not allow them to remain globally competitive. U.S. refineries today are among the cleanest and most efficient in the world, and the industry is adapting to meet regulatory requirements.⁷⁷ But the refining industry operates in a complex and sometimes contradictory regulatory environment. For example, the Environmental Protection Agency’s (EPA’s) proposed Tier III fuel requirements undermine EPA’s goal to reduce greenhouse gas emissions—while refineries do more processing to reduce sulfur levels in gasoline, doing so results in higher CO₂ emissions at refineries.⁷⁸

By choosing a more reasonable approach to regulation that allows time to fully implement effective existing rules before adding new layers of regulations, policymakers can enable America’s refining industry to remain the cleanest and most globally competitive in the world.

NUMBER OF REFINERIES DECLINES, BUT CAPACITY EXPANDS



Operable as of January 1 of each year. Source: EIA, *Petroleum Supply Annual*.



CHOOSING A SECURE
ENERGY FUTURE

Choosing a Secure Energy Future

America has the opportunity to transform and enhance our leadership role on the world stage if we make the right choices.

For decades, conventional wisdom held that the U.S. would be largely dependent on foreign sources of oil to satisfy its energy needs. Every president over the last 40 years has encouraged Americans to become less dependent on foreign oil through conservation and alternative fuels. But today, the U.S. has the potential to become energy self-sufficient in the not too distant future.⁷⁹ This development, which would have been unimaginable even a few years ago, could transform future geopolitics with regard to energy as well as enhance America's position in the world.

“A nation that fails to secure the energy its citizens and its economic engine need to keep functioning leaves itself vulnerable to external contingencies in a dangerous and uncertain world, and to the whims of foreign leaders and other actors who may not always have its interests at heart.”⁸⁰

— General James Jones, Former National Security Advisor to President Obama

Reducing America's dependence on foreign sources of oil has been seen by many, including the CNA's Military Advisory Board,⁸¹ as a national security advantage. But consider how current worldviews could change as a result of America's oil and natural gas renaissance. America could join the Middle East as a primary producer of the world's oil, potentially reducing the dominating influence of the Organization of Petroleum Exporting Countries (OPEC) over the world oil market and decoupling U.S. foreign policy decisions from its energy needs. Evidence of this can be seen in the effectiveness of the recent embargo against Iran, which arguably may never have been possible without corresponding increases in U.S. oil production.

America's oil and natural gas revolution also could strengthen existing U.S. allies, and possibly create new ones, while reducing our trade deficit. As our natural gas production rises, the U.S. could be seen by some European nations as an attractive alternative source of natural gas, which, today, is supplied largely by Russia.⁸² Japan also stands to benefit as it moves forward post-Fukushima to secure stable supplies of natural gas from the U.S.

The opportunity to achieve our long sought after energy security requires that America takes even greater advantage of its domestic oil and natural gas resources, and ensures we have the facilities and infrastructure necessary to bring oil and natural gas products to consumers in the U.S. and elsewhere.

Achieving Energy Self-Sufficiency

Today, America's energy outlook is vastly different from a few decades ago. In the 1970s, America was in the midst of a crippling oil embargo. The OPEC oil embargo resulted in a quadrupling of oil prices almost overnight,⁸³ and was the proximate cause of the economic recession of 1973. The effects of a second crisis in 1979 stemming from the Iranian revolution carried over to the early 1980s.⁸⁴

In response, the U.S. implemented measures to prevent future disruptions to America's oil supply, including promoting domestic oil production, creating the Strategic Petroleum Reserve to help insulate the U.S. from oil supply shocks, increasing energy efficiency, and promoting alternative fuels. Yet U.S. dependence on imports continued to increase throughout the 1970s, 1980s and 1990s.⁸⁵

America's oil imports have actually been declining since 2005, when we imported about 60 percent of the oil we consumed,⁸⁶ and fell to roughly 40 percent in 2012.⁸⁷ This decline is attributable to factors including increased domestic oil production as well as the struggling economy and increases in automobile fuel efficiency, but could be short-lived unless we ensure policy decisions that allow the U.S. to maintain and expand domestic production.

Fortunately, the U.S. has ample domestic energy resources to meet a significant share of domestic demand, amounting to an estimated 2,335 trillion cubic feet of technically recoverable gas and 233 billion barrels of technically recoverable oil.⁸⁸ These estimates keep growing, and the U.S. also has the means to develop them. Just two years ago, America's total oil production averaged 6.5 million barrels a day, according to government estimates. This year, that production is expected to set new records, rising over 30 percent to 8.45 million barrels per day.⁸⁹

If America chooses to fully utilize its domestic oil and natural gas resources and supports energy infrastructure projects, not only does it have the potential to become more energy secure, but, together with oil from Canada, could meet 100 percent of its liquid fuel needs by 2024.⁹⁰

Geopolitics of Oil

America's abundant oil and natural gas resources have the potential to dramatically reshape the global energy future. For decades, the Middle East was seen as the dominant

region for oil production. Four of the world's top 10 oil-producing countries were located in the Middle East in 2010,⁹¹ but, by sometime around 2015, the U.S. is projected to lead this elite club.⁹²

As U.S. oil production increases, other nations will replace America as major importers of oil. Global energy demand is anticipated to grow by more than one-third through the year 2035 with emerging economies accounting for roughly 90 percent of the increase.⁹³ In China, monthly net oil imports surpassed America's in September 2013, making that country the largest importer of oil in the world.⁹⁴

As America's oil production rises and North America begins to take its place among the world's top oil producers, there are significant impacts for the Middle East and Latin America, two oil-rich regions.

The Middle East has long been considered the world's oil pump, and for good reason—it possesses the largest proved crude oil reserves in the world.⁹⁵ In 2012, Saudi Arabia, Iran, Iraq, Kuwait, and the United Arab Emirates accounted for more than one-quarter of the world's total oil production.⁹⁶ Currently, Persian Gulf oil suppliers account for roughly 30 percent of America's total oil imports.⁹⁷ As America becomes more energy self-sufficient, the OPEC nations will naturally look to other areas of growing demand, particularly in Asia and the Southeast Asian nations.⁹⁸ Also, the influence of OPEC nations over the world oil market and U.S. foreign policy could begin to wane.

CHOOSING TO PROTECT THE ENVIRONMENT

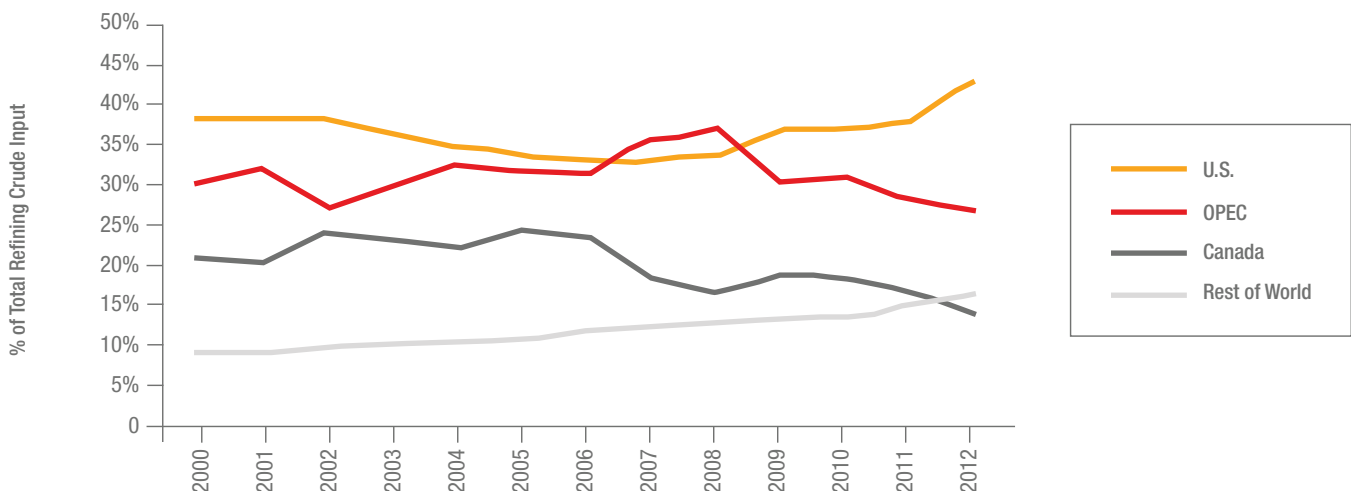
Using Carbon Dioxide for Oil Production



The U.S. oil and natural gas industry is using carbon dioxide to help produce oil through a process known as Enhanced Oil Recovery (EOR). This technology injects carbon dioxide into underground oil fields to help bring oil to the surface that otherwise would have been left behind.

Today, there are more than 100 such projects active in the U.S. that together sequester more than 2 billion cubic feet of carbon dioxide while producing more than 270,000 barrels of oil per day.^{99,100} America's oil and natural gas industry has been a world leader in developing and using this innovation, with 89 percent of all carbon dioxide EOR occurring in the U.S.¹⁰¹

CRUDE OIL INPUTS TO U.S. REFINERIES 2000-2012

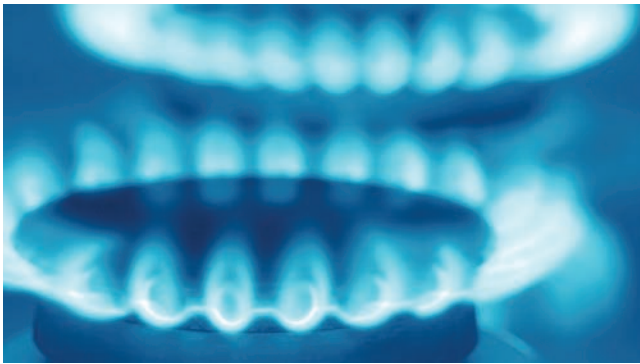


Source: API calculations based on EIA Petroleum and Other Liquids Data (<http://www.eia.gov/petroleum/data.cfm>)

SECTION 2: Choosing a Secure Energy Future

Like the Middle East, Latin America also has considerable oil resources. Venezuela has the world's second-largest amount of proved oil reserves behind Saudi Arabia.¹⁰² Mexico, in fact, is the third-largest supplier of oil to the U.S.¹⁰³ Yet political upheaval coupled with inadequate technological capabilities has taken a toll on Latin America's oil production, which has fallen every year between 2002 and 2011.¹⁰⁴

Taking advantage of oil sands from Canada can help the U.S. meet its domestic demand by compensating for declining production in Mexico and Venezuela. Also, should Latin American countries be able to better develop their oil reserves, there may still be opportunities for American refineries to supply products to the expanding economies in this region. Demand for refined products there has increased, but refining capacity has lagged behind, opening a potential market for the U.S. refining industry.¹⁰⁵ For these opportunities to be realized, the U.S. must elect to take full advantage of its oil and natural gas resources and ensure the capability to refine those resources in America.



Geopolitics of Natural Gas

As is the case with oil, the U.S. is producing more natural gas than ever before through hydraulic fracturing. With increased exports and adequate pipeline infrastructure and facilities, U.S. natural gas could become a stable energy supply for U.S. allies in Europe and Asia, benefiting our economy and helping to reduce our trade deficit. But for this to occur, America must become a willing participant in the international natural gas market. Unfortunately, there is a finite window of opportunity for the U.S., with many liquefaction facilities under construction or being planned in Australia and other LNG-exporting countries.

Russia is the world leader in proved natural gas reserves, possessing 1,688 trillion cubic feet, followed by Iran with 1,187 trillion cubic feet and Qatar with 890 trillion cubic feet.¹⁰⁶ Nearly 75 percent of the world's proved natural gas reserves are found in the Middle East and Eurasia, with

Russia, Iran, and Qatar together accounting for about 55 percent of reserves.¹⁰⁷

Russia has been and remains a significant player in the global natural gas market. Its natural gas reserves represent one-quarter of the world's total proved reserves, with most of them located in Siberia, and Russia holds the position of the world's second largest producer of natural gas behind the U.S.¹⁰⁸ In 2010, about 37 percent of Russia's total natural gas exports went to customers in the Commonwealth of Independent States (former members of the USSR), 31 percent went to Eastern European countries, 27 percent was transported to Germany, and the remaining amount went to Turkey, Italy, and France.¹⁰⁹

However, shale and tight formations have placed the U.S. in a strong position because supplies from tight formations are abundant, technologies and best practices are established, state regulatory programs are effective, and private mineral ownership encourages development.

America's emergence as the top world producer of natural gas presents the U.S. with valuable opportunities. While roughly 95 percent of the natural gas produced in America in 2011 was consumed here, development of our natural gas resources could easily allow the U.S. to affordably supply our domestic economy¹¹⁰ and also allow the U.S. to seek new overseas markets for natural gas.

Though the U.S. is slowly approving terminals to export liquefied natural gas (LNG) to markets in Europe and Asia, and companies are lining up in the U.S. to build these facilities, applications need to be approved more quickly. While as of December 1, 2013, five applications have been approved to export LNG to non-free trade agreement nations during the past two and a half years, more than 20 are still awaiting consideration.¹¹¹ The longer U.S. policymakers wait to approve these applications to export LNG, the greater the chance that America will miss its opportunity to achieve the associated economic benefits. Net average U.S. job growth resulting from LNG exports could range from 73,000 to 452,000 between 2016 and 2035, and GDP gains could amount to between \$15.6 billion and \$73.6 billion annually, depending on just how much LNG is exported.¹¹²

Some have suggested that federal officials should only approve a limited number of LNG export applications to prevent domestic natural gas prices from rising. It would be a mistake for government to attempt to control natural gas prices through an arbitrary quota of export approvals. Interfering with market competition could constrain resource development with negative implications for supply and price. A Department of Energy-sponsored study of LNG impacts conducted by NERA Economic Consulting found that under all scenarios, LNG exports created a net economic benefit to the U.S. economy.¹¹³



Canadian Oil Sands

Canada has long been America’s number one trading partner—and our largest source of foreign oil, accounting for more than one-quarter of America’s oil imports in 2012.¹¹⁴ Strengthening this relationship by approving the construction of the Keystone XL and other pipelines between the U.S. and Canada will enable the U.S. to take greater advantage of Canada’s vast oil sands resources.

The full Keystone XL pipeline will be able to transport up to 830,000 barrels of oil each day from Canada and America’s Bakken Shale formation to U.S. refineries¹¹⁵—that amounts to more than 90 percent of what we imported from Venezuela in 2012.¹¹⁶ About 12 percent of the pipeline’s capacity will be available to transport U.S. oil from fields in North Dakota and Montana to refineries in the Southern U.S.¹¹⁷

In addition to promoting America’s energy security, production of Canada’s oil sands already supports 60,000 U.S. jobs¹¹⁸ and at least 2,400 American companies from 49 states are involved in oil sands development, from engines made in Indiana to tires made

in South Carolina.¹¹⁹ New oil sands development could support more than 500,000 new jobs within 25 years.¹²⁰

A U.S. State Department analysis shows that building Keystone XL will support 42,000 jobs and put \$2 billion in workers’ pockets over the next two years.^{121,122} Not to mention that building the pipeline will have “no significant impact to most resources along the proposed project route,”¹²³ and will have no impact on climate change because Canada’s oil sands will be developed regardless of its construction.¹²⁴

Buying oil from Canada makes sense, because for every U.S. dollar spent on Canadian products, such as oil, up to 89 cents is returned to the U.S. in the form of Canadian imports of U.S. goods. By contrast, OPEC nations only return 33 cents to the U.S. through spending on American goods and services.¹²⁵

Building the Keystone XL pipeline and other infrastructure to connect Canada and the U.S. is a wise choice that will create thousands of U.S. jobs, strengthen our economy, and help America meet 100 percent of its liquid fuel needs from North American oil by 2024.¹²⁶



452,000

POTENTIAL NET U.S. JOB GROWTH RESULTING FROM LNG EXPORTS BY 2035

\$73.6 BILLION

POTENTIAL GDP GAINS FROM LNG EXPORTS BY 2035

500,000

THE NUMBER OF NEW JOBS SUPPORTED BY NEW OIL SANDS DEVELOPMENT WITHIN 25 YEARS



Safety is paramount in everything America’s oil and natural gas industry does to produce, refine, and transport the energy that consumers rely upon each and every day. The industry has a strong safety record as it produces energy and refined products in difficult environments, with heavy equipment, high temperatures, and under high pressures. The oil and natural gas industry is committed to a goal of zero fatalities, zero injuries, and zero incidents.

One example of this commitment can be seen in the industry’s many constant efforts to develop, follow, and improve best practices for safe operations. Since 1924, API has been the leader in developing industry standards for oil and natural gas companies.¹²⁷

The API Standards Program is a collaborative effort among industry and key stakeholders including governmental representatives and academic institutions to develop and improve standards for operational safety. This program, which is accredited by the American National Standards Institute, the same organization that accredits our national labs, has developed more than 600 standards covering every segment of the industry, more than 100 of which have been cited 270 times in existing federal regulations.¹²⁸

API’s WorkSafe Program provides industry training for workers and contractors in the latest safety standards. One WorkSafe program, E&P Onshore Operations, provides training on critical safety issues found at onshore job sites. Another WorkSafe program, Service Station Contractor Safety, provides training in the latest service station industry safety practices.¹²⁹

Onshore Safety

The industry develops tailored well designs for each operation, constantly monitors and tests well pressure, and has programs for continuous maintenance and inspection of all equipment. Once a well has been explored, drilled, and put into production, maintaining safety at the well site remains a priority. Many state and regional industry associations have developed educational campaigns to raise public awareness about safety at these locations. One organization designed a program for students in elementary, middle, and high schools that includes safety folders, posters, DVDs, and a website.¹³⁰

Hydraulic fracturing, in particular, has benefited from constant improvement and application of best practices, allowing the industry to safely and effectively unlock shale oil and natural gas. API has developed a suite of industry standards and best practices specific to hydraulic fracturing to guide unconventional well construction and management for protection of communities and the public. These practices, which incorporate and cite more than 65 established standards, practices, and technical reports, were created to augment the safety and environmental performance of unconventional resource development.¹³¹

CHOOSING TO PROTECT THE ENVIRONMENT

Officials Attest to the Safety of Hydraulic Fracturing



Numerous government agencies and officials have confirmed the safety of hydraulic fracturing.

Former EPA Administrator Lisa Jackson testified there is no “proven case where the fracking process itself has affected water.”¹³² Former Secretary of the Interior Ken Salazar stated, “[Hydraulic fracturing] is creating an energy revolution in the United States ... I would say to everybody that hydraulic fracturing is safe.”¹³³

Offshore Safety

Following the 2010 Deepwater Horizon incident, the industry quickly moved to develop standards and further improve safety practices in concert with the federal government. The Center for Offshore Safety (COS) was established by the industry to focus on safety in the offshore Gulf of Mexico.

The COS is designed to promote the highest level of safety for offshore drilling, completions, and operations. The COS's mission and guiding principles are designed to ensure continuous improvement in safety and operational integrity.¹³⁴ In fact, three COS guidelines have already been adopted by the Bureau of Safety and Environmental Enforcement into its own regulations.¹³⁵

To accomplish the COS's mission, third-party auditing and safety and environmental management system certification is conducted to help ensure that the industry is applying robust safety systems throughout offshore operations.¹³⁶ Through the COS, industry members demonstrate their commitment to safety and ensure their processes, training, and technology are regularly examined and improved.

Under federal law, all oil and natural gas companies with offshore facilities must file emergency response plans with the U.S. Coast Guard and Bureau of Safety and Environmental Enforcement. Offshore facilities are also subject to frequent safety drills and inspections by federal and state authorities to ensure response capabilities are maintained at a high level.¹³⁷

Safety in Oil Refining

America's 143 refineries¹³⁸ convert crude oil into fuels and other products consumers rely on and petrochemicals that are the building blocks of various manufactured goods. American refineries are heavily regulated entities subject to federal, state, and local safety requirements; they utilize various procedures, whether at the refining facility or associated marine terminals, transfer stations, and storage facilities, to ensure their operations are safe for workers, contractors, and communities.¹³⁹

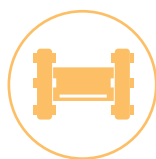
API has taken proactive steps to go beyond regulatory requirements and assist the refining industry in safe operations. Through the API Process Safety Site Assessment Program, higher risk activities at petroleum refining facilities and facilities' process safety systems are audited by independent safety experts. These assessments evaluate the quality of the facility's written programs as well as the effectiveness of field operations in areas such as mechanical integrity, safe work and operating practices, and process safety leadership. Facilities can then take these independent findings and implement enhanced industry practices to improve their safe operations.

Further, the Advancing Process Safety (APS) program is working to better communicate and share knowledge to improve safety. APS program elements improve safety by promoting learning through shared experiences, providing benchmarking opportunities through performance metrics and site assessments, and identifying trends and patterns to enhance operational safety.



600

THE NUMBER OF SAFETY STANDARDS DEVELOPED BY THE API STANDARDS PROGRAM THAT COVER EVERY SEGMENT OF THE INDUSTRY



185,000

MILES OF PIPELINES IN THE U.S. MOVING CRUDE OIL TO REFINERIES AND PETROLEUM PRODUCTS TO MARKET

99.9%

AMOUNT OF OIL DELIVERED TO THE U.S. BY OCEAN TANKERS THAT REACHED ITS DESTINATION WITHOUT INCIDENT OVER THE LAST DECADE

143

THE NUMBER OF OIL REFINERIES IN AMERICA



Safe Transport of Oil, Natural Gas, and Petroleum Products

The industry's commitment to safety extends beyond production and refining to safely transporting oil and natural gas via tank trucks, pipelines, ocean tankers and rail.

Today, there are about 185,000 miles of pipelines in the U.S. carrying crude oil to refineries and petroleum products to market,¹⁴⁰ and they have an impressive track record of delivering these commodities to their destinations without incident more than 99 percent of the time.¹⁴¹ From 1999 to 2011, the number of liquid spills from pipelines has been reduced by 59 percent, and the volume spilled has been cut by more than 43 percent.¹⁴² It's no wonder pipelines are widely considered a safe and efficient way to move energy products overland for long distances.

The industry is committed to sharing best practices to ensure pipeline safety. The Pipeline Performance Tracking System was created in 1998 as a means for the industry to know more about its own safety and environmental performance. Participants complete incident and infrastructure surveys, enter the data into the tracking system, and use it to identify trends across the pipeline industry that can improve performance and safe operations.¹⁴³ Also, API hosts a number of meetings every year that allow pipeline operators to share safety practices and learn from one another.

Additionally, 21 API consensus standards or recommended practices have been incorporated into the Pipeline and

Hazardous Materials Safety Administration's regulations to support pipeline safety. These standards cover a range of issues including pipe specifications; welding practices; tank construction, inspection and repair; public awareness; leak detection; control room operations; and control system display design.

Rail continues to be a safe method for transporting crude oil over land. Oil is moved safely by rail more than 99 percent of the time.¹⁴⁴ The oil and natural gas industry has been working with rail operators to design and build state-of-the-art railcars that exceed specifications from the federal government. The industry has also been working with regulators since 2011 to create new railcar specifications that provide maximum safety for the public, including design enhancements that protect equipment located on top of the tank, improve the pressure relief device, and increase the thickness of the railcar itself, as well as the head shields located on both ends of the car. This has allowed even safer railcars for transporting crude oil to enter service earlier.

When it comes to transporting oil and petroleum products over water, tankers have proven their worth both in terms of safety and effectiveness. Over the last decade, more than 99 percent of oil delivered to the U.S. by ocean tankers reached its destination without incident.¹⁴⁵ Today's state-of-the-art tankers are the product of the industry's commitment to safety, implementation of best practices, and computer-assisted design. The tankers that cross the oceans today are stronger, more durable, and more maneuverable than ever before.



CHOOSING INNOVATIONS
AND INFRASTRUCTURE THAT
UNLOCK AMERICA'S ENERGY POTENTIAL



Choosing Innovations and Infrastructure that Unlock America's Energy Potential

America was built on what people envisioned, not what they saw in front of them. The oil and natural gas industry is no different. The industry is one of the most technologically advanced in the U.S.¹⁴⁶ Thanks to the industry's constant pursuit of innovation and utilization of state-of-the-art technologies, it is able to explore, produce, refine, and transport oil and natural gas more safely and more efficiently with less impact on the environment than ever before.

These innovations enable the industry to take advantage of previously inaccessible sources of oil and natural gas that have already reinvigorated our economy and reduced America's reliance on imported oil. By continuing to utilize these technologies to produce, refine, and transport even more of America's significant energy resources, the oil and natural gas industry will be able to create even more jobs and keep the U.S. on a path to energy self-sufficiency.¹⁴⁷ And, as development of oil and natural gas resources expands, the industry will continue innovating, as it has always done, to bring oil and natural gas to consumers.

But for this energy future to become a reality, America must choose to support policies that not only encourage the innovative production of our oil and natural gas resources, but that also enable the U.S. to maintain the necessary refining capability and infrastructure required to transport oil and natural gas.

State-of-the-Art Technologies

The oil and natural gas industry utilizes the newest groundbreaking technologies in its operations to produce America's domestic oil and natural gas resources, both onshore and offshore.

Onshore, innovations to drilling rigs enable them to drill deeper wells more efficiently. And "octopus" technology now allows multiple wells to be drilled from a single pad site. Rigs are capable of moving on hydraulic "tentacles" to new drill locations, enabling between four and 18 wells to be drilled from a single site with less impact on the environment.¹⁴⁸

Underground, innovations to drilling mechanisms are also improving oil and natural gas production. Long gone is the so-called "fishtail" drill bit used in the early days of oil production.¹⁴⁹ Many of today's drills utilize polycrystalline

CHOOSING TO PROTECT THE ENVIRONMENT

Promoting Cutting-Edge Research in Renewable Energy



The oil and natural gas industry is considered one of the most technologically advanced industries in America¹⁵⁰ for its innovations in exploring for oil and natural gas. But the industry is also participating in cutting-edge research to develop new renewable energy technologies that meet our energy needs.

For example, Shell Oil Company's Center for Sustainability at Rice University in Houston, Texas, sponsors research into new low-cost solar cells.¹⁵¹ A joint team from Rice and Pennsylvania State Universities funded by Shell, the U.S. Department of Energy and National Science Foundation has developed just such a solar cell composed of organic polymers that actually assemble themselves.¹⁵² When the polymer is exposed to heat, it organizes into individual bands only 16 nanometers wide that, when placed between a layer of glass and aluminum, create channels for the flow of electrons.¹⁵³ The potential for organic solar cells like this is significant as their affordability can put solar energy within reach of more consumers.¹⁵⁴



diamond compact bits, which allow faster and deeper drilling, sometimes more than 10,000 feet deep, without the need to replace the bit.¹⁵⁵ Also, “measurement-while-drilling” systems allow engineers and drilling teams on the surface to collect data about conditions the drill bit is experiencing as the well is being drilled, improving efficiency and accuracy.¹⁵⁶

The industry is also implementing new innovations and technologies developed by entrepreneurs for oil and natural gas production. One company builds solar-powered steam generators for heavy oil extraction to heat underground rock formations (where thick oil is located) to change its consistency for easier extraction. This technology uses curved aluminum mirrors to focus sunlight on a boiler tube containing water, which generates the steam needed to extract heavy crude.¹⁵⁷

Offshore, nearly half of the oil and natural gas discoveries made in 2012 were in ultra-deepwater plays.¹⁵⁸ Innovative technologies are making the production of oil and natural gas at these deeper depths a reality. Deepwater rigs utilizing new semi-submersible technology are able to drill around depths of 10,000 feet, and next-generation drillships can now drill to depths of 12,000 feet.¹⁵⁹

New subsea technologies enable companies to process oil and natural gas at the well site on the sea floor rather than on the surface, eliminating the need for costly and time-consuming flow lines to take oil and natural gas to above-water processing facilities. Subsea processing systems also allow one strategically placed platform to service multiple well areas, rather than requiring a platform at each well.¹⁶⁰

Exploration technologies are more advanced, as well. 3-D seismic mapping uses sound waves to create 3-D images of underground formations, enhancing visibility of the geologic formations and increasing the odds of discovering oil or natural gas resources.¹⁶¹ 4-D seismic mapping is also used to develop images of potential underground oil and natural gas reservoirs, and it also shows how the reservoir could change over time.¹⁶² The industry uses supercomputers to interpret all of the data obtained through 3-D and 4-D seismic mapping to accurately assess and explore potential oil and natural gas plays.¹⁶³

One entrepreneur is developing a high-resolution data collection and interpretation tool that can map density variations in rock formations by measuring the Earth’s gravitational field. This technology, which can be deployed in airborne and marine environments, can help focus expensive seismic operations and accelerate the exploration time line.¹⁶⁴

Technologies to improve future oil and natural gas production are in development, as well. The Advanced Energy Consortium at the University of Texas is leading an effort to develop so-called “smart dust,” or seismic-enhanced nanoparticles, which can be used during the drilling process to expose oil and natural gas deposits that cannot otherwise be detected with current technology.¹⁶⁵

As these and other innovations are transforming the way the industry produces oil and natural gas, America’s refiners are incorporating new technologies to improve our fuel choices.

Refining the Fuels of the Future

America's refineries are a critically important part of the oil and natural gas value chain for consumers. These state-of-the-art facilities use technologies to manipulate petroleum at the molecular level to take full advantage of hydrocarbons and produce a variety of petrochemicals and fuels. U.S. refineries produce some of the cleanest gasoline and diesel in the world.

As the fuel requirements of today's vehicles have changed to make them more efficient and produce fewer emissions, the refining industry has successfully met the need for these cleaner-burning fuels. In fact, new vehicle-emission requirements are largely possible through gasoline and diesel fuel advancements achieved at America's refineries.¹⁶⁶

Numerous improvements to gasoline and diesel fuels have been made by the refining industry. Sulfur content in gasoline has been reduced significantly over the past decade, and seasonal vapor pressure reductions now limit evaporative emissions that contribute to ozone.¹⁶⁷ With even more advanced vehicles on the road, the industry will play an important role in providing the fuels of the future, as well.

Clean-burning natural gas meets some of our fuel needs for cars and trucks. Compressed Natural Gas (CNG) fuel can be used in light-, medium-, and heavy-duty vehicles.¹⁶⁸ Liquefied Natural Gas, which is denser than CNG, is best suited for medium- and heavy-duty vehicles needing a longer driving range, such as trucks and buses.¹⁶⁹

Liquefied petroleum gas is another fuel that is made from liquid components recovered when refining crude oil and processing natural gas, including propane, butane, methane, and ethane. Though propane accounts for just 2 percent of the energy used in the U.S., it is the world's third most common engine fuel.¹⁷⁰

Biofuels made from renewable resources will continue to play an important role in our transportation fuel supply. Gasoline blends containing 10 percent ethanol can be used in nearly all vehicles and equipment.

Some advanced, second generation biofuels are chemically similar to gasoline and diesel. Unlike ethanol or biodiesel, these "drop-in" biofuels likely do not have the vehicle and infrastructure compatibility constraints that require additional blending, or special storage or handling. Advanced biofuels can be derived from algae, non-edible plants, crop waste, and other biomass. Our industry has made significant investments into research and development to integrate more advanced drop-in fuels into the fuel supply. For example, Chevron is working to turn forest-based feedstocks into fuels and bio-oil, suitable

for substituting for crude oil at a refinery; and Shell is developing technologies to convert plant sugars into renewable gasoline and diesel fuel, while ExxonMobil and Phillips 66 are investing in developing scalable algae-based biofuels.

Ensuring U.S. refiners' competitive position will allow America to remain at the forefront of developing new vehicle technologies that are more efficient and better for the environment.

Pipelines and Other Transportation Modes

If the U.S. is to fully realize an era of energy abundance and the jobs and economic growth that can come with it, we must ensure we have the energy transportation infrastructure, including pipelines, rail, truck, and maritime, that is required to bring these products to market. Each of the industry's modes of transportation plays an important role in this interconnected system. Keeping each one robust ensures that energy can reliably and efficiently reach consumers.

The U.S. has the largest network of oil and natural gas pipelines of any country in the world.¹⁷¹ It spans nearly 2.6 million miles,¹⁷² safely carrying more than 14 billion barrels of crude oil each year¹⁷³ and all natural gas produced in the U.S. (more than 25 trillion cubic feet in 2012).¹⁷⁴ While the amount of crude oil delivered by rail has increased dramatically, America's state-of-the-art oil and natural gas pipelines are the vital link connecting our abundant domestic oil and natural gas resources in some of the most remote locations in the nation to refineries and processing facilities, and then on to consumers here in the U.S. and around the globe.¹⁷⁵

In the past, crude oil imports largely entered the U.S. near refining facilities on the coasts, where pipelines then moved fuel and other petroleum products to customers across America. Today, with domestic production on the rise, the situation is increasingly the opposite. Oil and natural gas produced at remote new wells in America now need to be transported to U.S. refineries and processing facilities before they can be moved to market.

However, there is inadequate transportation infrastructure to meet this important need, which has cost consequences for local areas where domestic oil production is on the rise. Pipeline bottlenecks have caused oil produced in the Bakken Shale to sell at a discount compared to other crude oils.¹⁷⁶ According to the Energy Policy Research Foundation, Inc. (EPRINC), "These discounts are reflected in lower wellhead values, which may eventually lead to production-growth

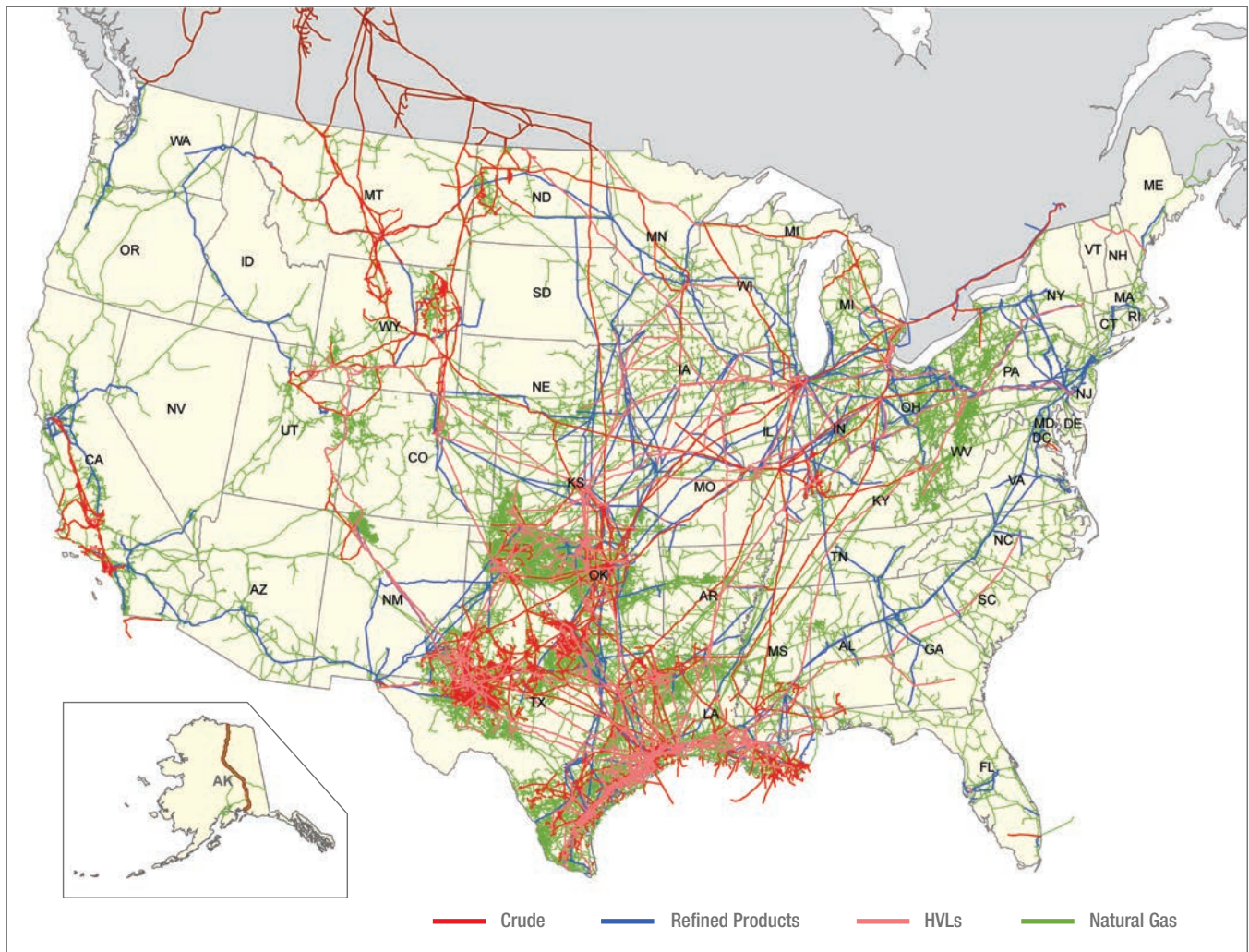
constraints, reduce revenues to royalty owners, and limit revenues to local, state, and federal governments should they persist.”¹⁷⁷ For example, EPRINC estimates a \$1 discount on crude oil produced in North Dakota’s Bakken Shale could reduce revenues to that state by nearly \$3 million each month.¹⁷⁸

New pipelines, including gathering lines and transmission or mainlines, rail loading and off-loading terminals, and marine terminals are all needed to move larger amounts of domestically produced energy and alleviate bottlenecks that prevent efficient and timely delivery.¹⁷⁹ This requires communities and policymakers to make the right choices with regard to infrastructure siting. It also requires the industry to continue to work closely with communities,

consulting with local officials and landowners to develop construction plans that minimize impact.

The Keystone XL pipeline can help meet America’s need for increased capacity. This “north-to-south” pipeline would play a major role in moving not just oil from Canada’s oil sands to U.S. refineries, but also oil being produced in U.S. Northern plains states such as North Dakota and Montana. Also important are “east-to-west” pipelines, such as the Enbridge pipeline that helps transport energy from the vast Bakken Shale. This pipeline, which is currently able to carry 450,000 barrels of oil per day, requires a number of upgrades to expand its capacity in order to keep pace with rising U.S. oil production.

U.S. EXPANDING CRUDE OIL, REFINED PRODUCTS, LIQUIDS, AND NATURAL GAS PIPELINES TO MEET DEMAND



Source: American Energy Mapping (AEM) 2013

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America's pipeline system uses a highly technical process involving specially trained technicians, computerized control centers staffed 24 hours a day, and sophisticated real-time

data monitoring sensors to keep oil and natural gas moving along its length. Maintaining and making constant improvements to the current pipeline system ensures America can continue to meet its demand for oil and natural gas without interruption.

Additionally, railroad transportation of crude oil is expanding. In some instances, pipelines have canceled projects after refiners that would have normally committed to a 10-year lease on the pipeline determined that they would use railroads to move their crude oil.¹⁸⁰ There are approximately 38,000 tank cars in crude oil service today.¹⁸¹ The amount of crude oil carried by rail has increased dramatically, rising from roughly 67,000 carloads terminated in 2011 to more than 236,000 carloads terminated in 2012.¹⁸²

Refiners and others are building receiving terminals to unload the railroad tank cars that are coming from crude production regions. This is being done as "rail facilities for loading and unloading crude can be constructed quickly and connected to an extensive rail network which reaches all major [refining] centers" or barge loading terminals.¹⁸³ Using rail to move crude provides opportunities for domestic refineries to use domestic crude oil as their feedstock.



America is on the verge of a promising new era in energy. Recent innovations in the oil and natural gas industry have placed America at the vanguard of an abundant energy future never before seen in the U.S. The marriage of horizontal drilling and hydraulic fracturing has unlocked our potential to produce vast quantities of oil and natural gas from previously inaccessible shale formations.

The new supplies of oil and natural gas obtainable through these innovations present tremendous opportunities for America's state-of-the-art refining industry to produce more, cleaner-burning fuels for American consumers while creating the opportunity to export more petroleum products not in demand here at home.

If America is to cross the threshold to this promising energy future, it will require making a deliberate choice to take full advantage of methods that enable development of our oil and natural gas resources, and to commit to ensuring we have the refining capability and infrastructure needed to take these products to market.

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Hydraulic Fracturing

Today, thanks to world-leading innovations by the industry in the practices of horizontal drilling and hydraulic fracturing, America has become a leading energy producer. Accessing the significant quantities of oil and natural gas that are known to exist in shale formations throughout the country had been impossible using traditional vertical drilling techniques, but, by combining horizontal drilling with hydraulic fracturing, the industry is now able to harvest shale oil and natural gas in significant quantities.

Without hydraulic fracturing, 45 percent of domestic natural gas production and 17 percent of oil production would be lost over the next five years.^{184,185} Further, hydraulic fracturing is expected to account for nearly 75 percent of natural gas development in the future.¹⁸⁶

Hydraulic fracturing is a proven technology that has been used safely in more than 1 million wells and has been continuously improved over time.¹⁸⁷ For example, to make hydraulic fracturing more efficient, companies are turning more and more to recycling the water used during the process, which dramatically reduces industry consumption of freshwater as well as the amount of wastewater produced. One Canadian company is even utilizing a new process that doesn't require water at all. Instead, it uses propane in the fracking process.¹⁸⁸

The industry also takes great care to capture methane emissions during the hydraulic fracturing process. A recent study conducted by the University of Texas and sponsored by the Environmental Defense Fund and nine oil and gas companies found that methane emissions from development of natural gas are lower than previously estimated, and that emissions from well completions are 97 percent lower than 2011 EPA estimates because of the use of methane-reducing equipment.¹⁸⁹

The combined innovations of horizontal drilling and hydraulic fracturing can unleash America's energy potential and bring about a future of economic growth and prosperity. But achieving an era of energy abundance can only become reality if America chooses to fully utilize these practices to take greater advantage of our abundant shale oil and natural gas resources.

CHOOSING TO PROTECT THE ENVIRONMENT

Using On-Site Field Natural Gas to Power Hydraulic Fracturing Equipment



The oil and natural gas industry is constantly innovating to reduce its impact on the environment. Hydraulic fracturing equipment typically operates on diesel fuel. But in a partnership with Caterpillar Global Petroleum and FTS International, Cabot Oil & Gas Corporation recently began using "dual fuel" technology that enables clean natural gas extracted directly from the field to power hydraulic fracturing equipment.

Not only is less diesel fuel used to run hydraulic fracturing equipment during this process, but fewer trucks are needed to transport the fuel to the production site.¹⁹⁰ As a result, natural gas can displace nearly 70 percent of the diesel fuel that is traditionally used to operate fracturing equipment.¹⁹¹

Increasing Access

Just as important as utilizing all industry methods to produce our domestic oil and natural gas resources is allowing access to areas where they are located. Oil and natural gas production is very much a forward-looking enterprise with a very long lead time required to find and develop these energy resources. To ensure our future energy security, the industry needs to begin exploring new oil and natural gas resources today so that we have the ability to produce energy in these areas 10, 15, even 20 years from now.

Roughly 87 percent of offshore areas controlled by the federal government remain off limits to oil and natural gas production.¹⁹² But considerable domestic resources are likely available in these areas. More than 48 billion barrels of oil and roughly 219 trillion cubic feet of natural gas are thought to be located in the Gulf of Mexico's Outer Continental Shelf (OCS). In Alaska's OCS, more than 26 billion barrels of oil and 131 trillion cubic feet of natural gas are estimated,¹⁹³ while the Atlantic OCS holds an estimated 3.3 billion barrels of oil and 31.3 trillion cubic feet of natural gas.¹⁹⁴

Onshore, federal permitting and leasing are on the decline. The number of drilling permits issued on federal lands declined by 36 percent between FY2008 and FY2012, and the number of wells drilled fell by 40 percent during that time, according to the U.S. Department of Interior.¹⁹⁵ The wait for a federal drilling permit averaged 228 days in 2012¹⁹⁶ compared to 10 days for a state permit in North Dakota or 14 days in Ohio.¹⁹⁷ As a result, oil production on federal land was down 6 percent and natural gas production declined 21 percent between 2009 and 2012, according to the Congressional Research Service.¹⁹⁸ By contrast, oil production increased 31 percent and natural gas production was up 25 percent on private and state lands.¹⁹⁹

There is significant potential for America to reap the economic and energy benefits of our vast oil and natural gas resources, but it will require policymakers to open federal lands to safe and responsible development, and to ensure a timely and efficient regulatory framework that supports energy production.



TREMENDOUS AMOUNTS OF RESOURCES ARE BELIEVED TO EXIST IN OFFSHORE AREAS THAT REMAIN OFF LIMITS TO OIL AND NATURAL GAS PRODUCTION. IN ALASKA'S OCS, MORE THAN

26 BILLION
BARRELS OF OIL ARE PREDICTED TO EXIST

 **87%**

FEDERALLY CONTROLLED OFFSHORE AREAS THAT REMAIN OFF LIMITS TO OIL AND NATURAL GAS PRODUCTION

 **36%**

DECREASE IN DRILLING PERMITS ISSUED ON FEDERAL LANDS BETWEEN FY2008 AND FY2012 ACCORDING TO THE U.S. DEPARTMENT OF INTERIOR



OIL PRODUCTION INCREASED

31%

AND NATURAL GAS PRODUCTION WAS UP

25%

ON PRIVATE AND STATE LANDS



CHOOSING POLICIES THAT
PROMOTE OIL AND NATURAL GAS

Choosing Policies that Promote Oil and Natural Gas

The availability of abundant energy resources within the U.S. is transforming our nation in numerous ways. Communities that struggled during the recession are now thriving with jobs in areas where oil and natural gas development is occurring. U.S. manufacturers are more globally competitive due to affordable supplies of domestic natural gas. Today, America is a world leader in oil and natural gas production and on a path to more than just energy self-sufficiency, but to a place as a global energy superpower.

Our nation is in a position to chart a course that could enable these economic and energy security gains to become a new norm for America. Doing so will require elected officials at every level of government to take action to unlock the tremendous potential that exists to develop our oil and natural gas resources and pursue forward-looking policies that will allow America to capitalize on this bright energy future.

For example, many federal lands and waters remain off limits to energy production. Opening more of these resource rich areas to exploration and development more quickly will allow America to reach its future energy potential.

Imposing higher taxes on the oil and natural gas sector will prevent development of energy resources. The industry already pays an effective tax rate that is higher than any other U.S. industry (44.6 percent from 2007 to 2012).²⁰⁰ New punitive taxes—or the elimination of existing business tax provisions—will discourage capital investment in new wells, reducing job

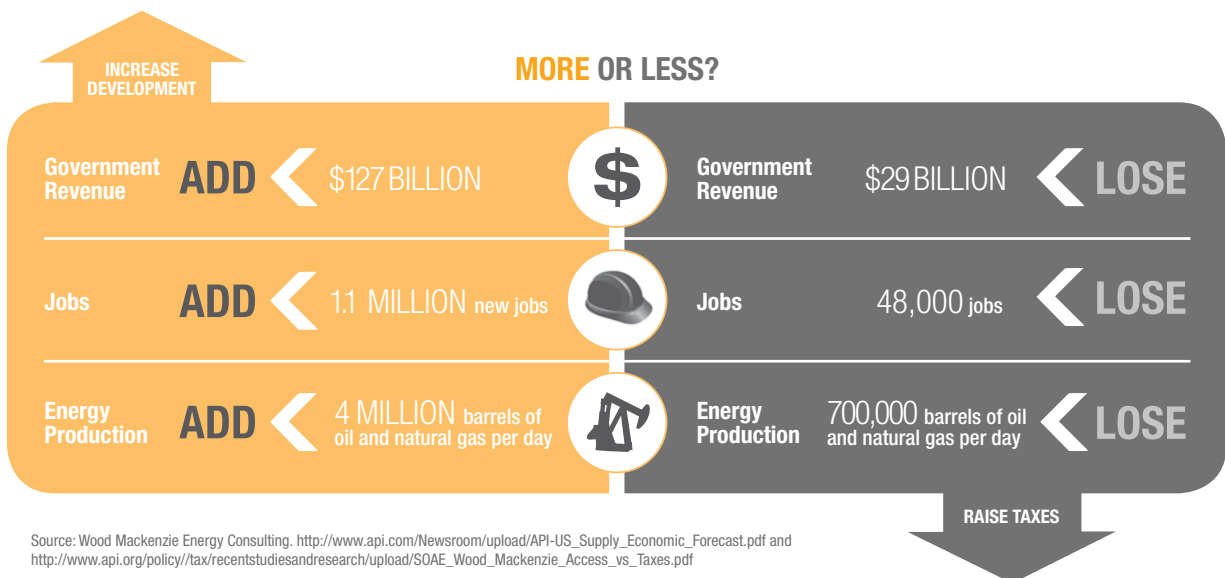
creation and possibly increasing energy costs for consumers. Also, ensuring capital cost recovery for oil and natural gas companies is preserved in any federal tax reform efforts should be a clear priority. Capital intensive industries play an outside role in supporting economic growth and job creation, which remain critical priorities for our country.

Today, America is a world leader in oil and natural gas production and on a path to energy self-sufficiency

Layering additional duplicative or burdensome regulations on U.S. oil and natural gas companies is the largest barrier to a thriving energy sector. For example, hydraulic fracturing has been successfully regulated for decades at the state level with no confirmed cases of groundwater impact. Imposing an unnecessary, one-size-fits-all federal regulatory regime on top of specifically crafted state-designed regulations could create production delays and needless uncertainty, jeopardizing job creation and economic growth.

In addition to taking greater advantage of America's energy resources, government policies should maintain our ability to refine these resources within the U.S. Ample time and analysis should be provided to determine if existing regulations are effective before imposing new requirements on the industry. For example, U.S. refiners have made huge gains in lowering the sulfur content of fuels. New regulations could drive refining activities overseas creating job loss and disinvestment in the U.S. economy.

ECONOMIC IMPACTS OF POLICY CHOICES



The Renewable Fuel Standard (RFS) requires refiners and importers of gasoline and diesel to blend up to 36 billion gallons of biofuels by 2022. As the mandate increases each year, the necessary volume of ethanol is poised to exceed 10 percent of gasoline supply, a situation referred to as the ethanol blend wall. The blend wall forces refiners and importers of gasoline and diesel fuel to remain in compliance by limiting the volume of transportation fuels that can be supplied to the domestic market. The resulting supply shortages and cost impacts could severely harm our nation's economy.²⁰¹ The EPA is charged with implementing the RFS and must take steps to mitigate some of the most drastic impacts of the mandate, but since EPA's authority is limited to year-by-year short-term fixes, Congress should repeal the program entirely. Ethanol has favorable blending characteristics, and will continue to supplement gasoline supply, but the RFS has outlived its usefulness and unnecessarily threatens our transportation fuel supply and our economy. It needs to be repealed.

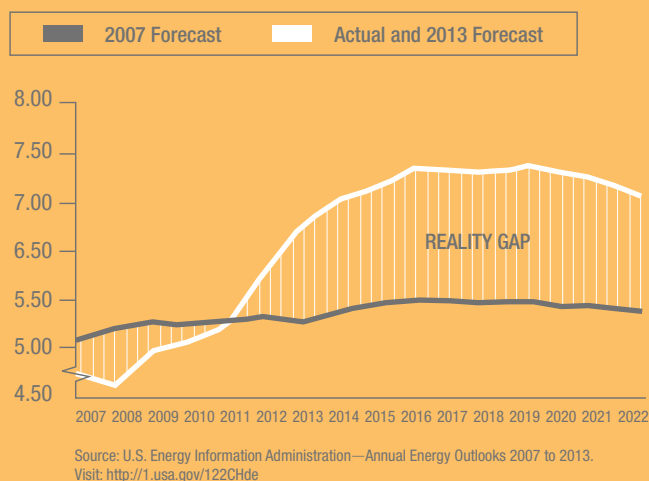
Finally, policies should support oil and natural gas industry facilities and infrastructure necessary to bring energy and petroleum-based products to consumers and businesses. This includes making improvements to existing pipelines, expedited permitting processes, and allowing new pipelines to be built in areas where energy development takes place. Construction of the Keystone XL pipeline is one such example. In addition to moving hundreds of thousands of barrels of oil each day from Canada to U.S. refineries, Keystone will create thousands of much needed American jobs.²⁰² Policies must also allow the U.S. to export its natural gas. More permits to build terminals for the export of LNG should be quickly approved. This will allow the free market to determine ideal natural gas supply levels and America to enjoy significant economic benefits. One third-party analysis found increasing LNG exports could create 450,000 new jobs and add nearly \$70 billion to U.S. GDP by 2035.²⁰³

America's oil and natural gas industry stands ready to work with policymakers and the public to make wise choices that will enable the U.S. to realize the many benefits that can flow from our domestic oil and natural gas resources. Smart policy choices we make today can create jobs and guarantee our energy security for decades to come, but shortsighted decisions will squander our energy resources and forfeit the economic and geopolitical advantages we stand to gain. During previous decades of declining domestic energy production, our policy options were limited and largely driven by world events. Now our ability to achieve energy security rests on decisions here at home. The U.S. has an opportunity that few nations ever get—to control our energy future. Seizing that opportunity guarantees significant benefits for all American families, businesses, our economy and our national security.

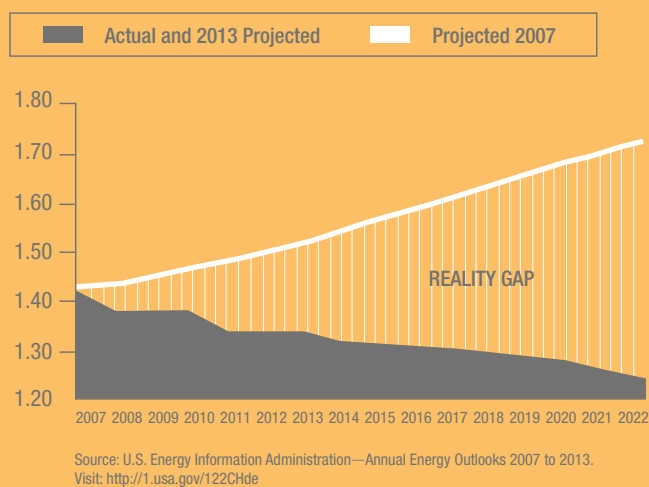
The Renewable Fuel Standard— Outdated and Unrealistic

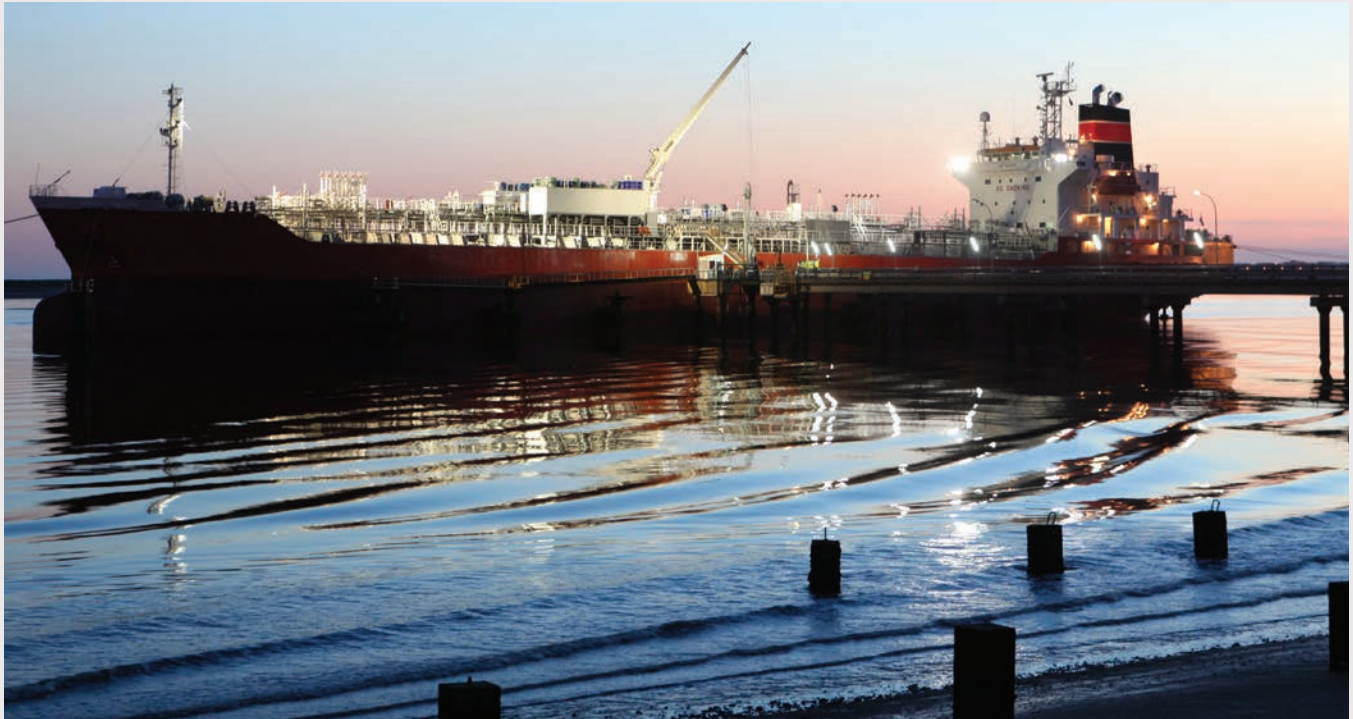
When the Energy Independence and Security Act of 2007, which mandated the RFS, was passed, the state of energy and the economy were very different. We are using less gasoline, and yet the mandates for blending renewable fuels keep growing. Our energy security has improved with a dramatic increase in domestic crude oil production and imports are falling, but not because of the RFS. Consumers are not choosing flex-fuel vehicles, and advanced renewables production projections have not materialized. The RFS is an artificial mandate from another time with real impacts on today's consumers.

CRUDE OIL DOMESTIC CRUDE PRODUCTION (million barrels per day)



MOTOR GASOLINE CONSUMPTION (hundred billion gallons per year)





America's energy infrastructure system is critical to the efficient movement of crude oil and natural gas to refineries and to businesses and consumers as end customers. Keeping that infrastructure current for today's energy realities will be among the energy choices facing policymakers in 2014 and beyond.

Built decades before the shale energy revolution that defines markets today, the current pipeline grid was designed to transport imported crude oil and petroleum products from the Gulf Coast to points north. Surging production in the Northeastern U.S., remote locations in the Bakken region, and in the Canadian oil sands

requires not only expanded transportation capacity but a wholesale redesign of the energy infrastructure network. Pipeline shipments of crude oil from the Gulf Coast to the Midwest decreased 500,000 barrels per day from 2008 to 2013 while shipments in the opposite direction—from the Midwest to the Gulf—jumped from just 50,000 b/d in 2008 to over 380,000 b/d in 2013.²⁰⁴

Relative to today's production realities, the existing energy transportation system is virtually upside down, and righting it will eliminate costly inefficiencies as well as generate substantial economic growth. Updating infrastructure to our new energy reality could generate an estimated \$1.14 trillion in capital investments between

INVESTMENT IN THE THE OIL AND NATURAL GAS INDUSTRY'S TRANSPORTATION AND STORAGE INFRASTRUCTURE COULD HAVE A HUGE ANNUAL IMPACT ACROSS THE ECONOMY. BETWEEN 2014 AND 2025, IT COULD CONTRIBUTE, ON AVERAGE, UP TO:

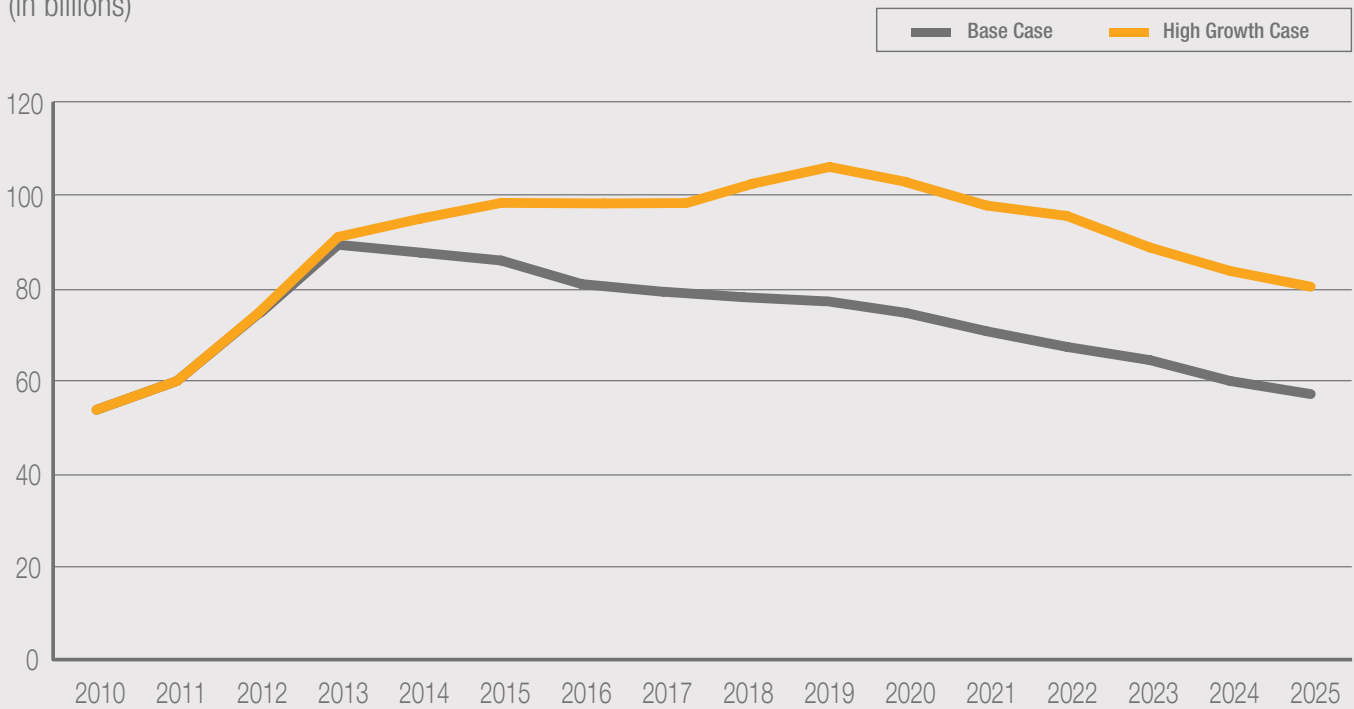
 **\$120** BILLION
TO THE ECONOMY

2014 and 2025, according to a new report by IHS.²⁰⁵ These investments in midstream and downstream infrastructure—including pipelines, storage, processing, rail, and marine components—will ripple through the U.S. economy creating jobs, increasing GDP and labor income, and boosting tax revenue to federal, state, and local governments.

Midstream and downstream infrastructure investment could support as many as an estimated 1.15 million jobs on an average annual basis over the 2014-2025 period, according to IHS, adding up to \$120 billion on average per year to the economy and generating up to \$27.5 billion in average annual revenue to the government.

Pipeline investment alone could support up to 830,771 jobs on an average annual basis over the 2014-2025 period. Lack of adequate pipeline capacity in surging production areas creates chokepoints and bottlenecks that raise production costs and create growth constraints. “If I produce a barrel of oil in the Permian, my ability to move it to market is restricted,” explains University of Houston energy economics professor Ed Hirs. “The pipelines are full. The only way out is trucking.”²⁰⁶ Difficulties in transporting supplies to the most valuable markets forces producers to sell at a discount, discouraging production investment by

ANNUAL INVESTMENT TOTAL (in billions)



Source for Annual Investment Total Graph: IHS, "Oil & natural gas transportation & storage infrastructure: Status, trends, and economic benefits," December 2013



1.1
MILLION
JOBS SUPPORTED

\$75
BILLION
IN INCOME FOR WORKERS

\$27.5
BILLION
IN GOVERNMENT REVENUE



reducing wellhead values and revenues to royalty owners, as well as local, state, and federal governments. By contrast, investing in midstream and downstream pipeline infrastructure could contribute up to \$86 billion to the economy on average annually, generate up to \$19.6 billion in government revenue, and add up to \$53.5 billion in labor income on average per year.

In the absence of sufficient pipeline location and capacity, transportation by rail and barge has increased significantly. Since 2009, transportation of crude oil by pipeline has experienced an annual growth rate of 5 percent while rail movement has experienced an annual

growth rate of 119 percent.²⁰⁷ More than 67 percent of Williston Basin production—650,000 b/d—is transported by rail.²⁰⁸ Barge shipments from the Midwest to the Gulf Coast are up nearly 90,000 b/d since 2010.²⁰⁹

While these alternatives provide flexibility for transportation gaps, they must be integrated into a systematic restructuring designed to meet long-term needs. Modernizing our energy infrastructure system provides opportunities for major economic growth and job creation, and it is essential for realizing the full benefits of new production gains.

CAPITAL INVESTMENTS AMOUNTING TO

\$1.14 TRILLION

COULD BE GENERATED BY 2025 BY UPDATING THE OIL AND NATURAL GAS INDUSTRY'S INFRASTRUCTURE TO OUR NEW ENERGY REALITY

PIPELINE INVESTMENT COULD SUPPORT UP TO

830,771

JOBS ON AN AVERAGE ANNUAL BASIS OVER THE 2014-2025 PERIOD



CONCLUSION: THE WISE CHOICE—
ENERGY FOR A THRIVING AMERICA



The Wise Choice—Energy for a Thriving America

America's oil and natural gas industry plays a vital and uniquely foundational role in America's economy—every day delivering the fuel that powers economic growth and job creation, underpins our society through feedstocks and products that support our quality of life, and drives revenues to government at all levels. More than 100 years of innovation back the industry's successful development and delivery of our country's vast quantities of oil and natural gas cleanly, efficiently, and reliably.

Today, breakthroughs in technologies and processes enable the industry to take advantage of our energy resources like never before. Our economy is reaping the benefits of this energy renaissance even as it struggles to fully recover from the recession. In 2011, the oil and natural gas industry alone accounted for more than \$1 trillion of America's GDP and was responsible for supporting 9.8 million U.S. jobs

Today, breakthroughs in technologies and processes enable the industry to take advantage of our energy resources like never before

across a wide variety of professions.²¹⁰ And, thanks to the industry's surge in production of clean natural gas, the U.S. manufacturing sector, which had suffered plant closures and layoffs in the wake of the 2009 recession, is beginning to rebound. U.S. manufacturers are reopening their doors and hiring workers again, and are finding themselves with an international competitive advantage.²¹¹

With increased access to domestic resources, America's oil and natural gas revolution also holds tremendous promise for our future energy security

With increased access to domestic resources, America's oil and natural gas revolution also holds tremendous promise for our future energy security. Between America's shale oil resources and increased imports from Canada's vast oil sands, which would be possible through approval and construction of the full Keystone XL pipeline, the U.S. could meet all of its liquid fuel needs by 2024.²¹² Moreover, fully developing our abundant oil and natural gas resources would provide even more support for the economy, creating nearly 1.4 million new jobs in numerous industries throughout the U.S.²¹³

To fully realize the opportunities of this new energy future, we must make the deliberate choice to take greater advantage of our oil and natural gas resources and ensure our ability to refine these resources. We must build the facilities and infrastructure needed to bring fuels, natural gas, and other petroleum products to market. North America's energy resources are bountiful. The benefits of unlocking them flow throughout all sectors of our economy and to families in every state. Our industry remains committed to working closely with elected leaders at the local, state, and federal levels. Together, we can choose energy for a thriving America.



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