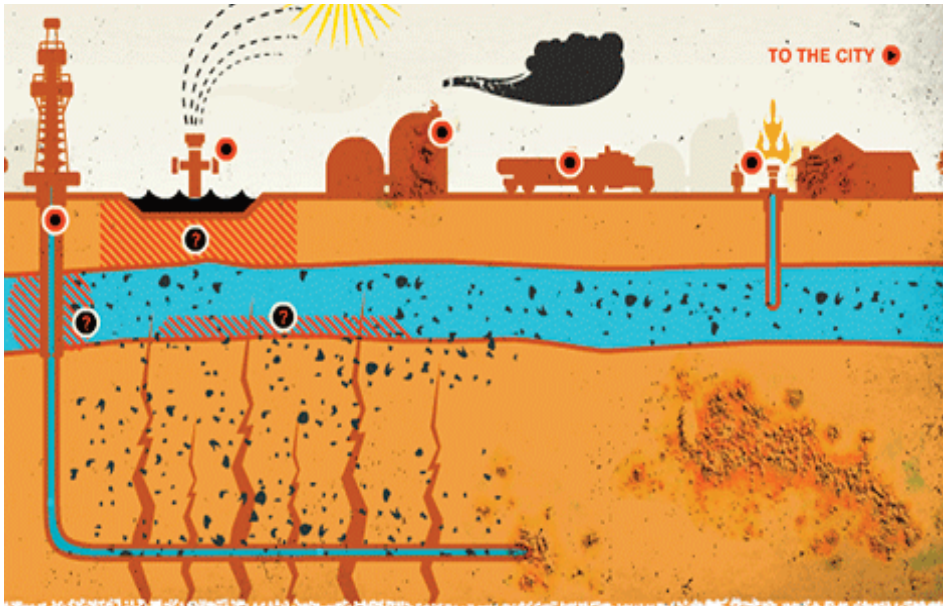
The Shale Energy Revolution



Source: Reflections on George Monbiot, Post Carbon Institute, July 5, 2012. Reprinted with permission

Forty years ago, the world suffered a major shock, when the Arab members of OPEC, the oil cartel, instituted a boycott of oil sales to the US and Western nations as punishment for their perceived support of Israel in the 1973 Yom Kippur War. Although the boycott was short-lived, it was quickly followed by a tripling of oil prices by OPEC and oil was transformed from a mundane commodity into a political weapon.

In the intervening years, OPEC has succeeded in keeping oil prices high, despite both lower demand (from widespread adoption of conservation measures and deployment of alternative fuel sources) and higher supply (from new sources of supply and more advanced extraction methods).

Additionally, an entire generation has been raised with the idea that the world had only a finite supply of fossil fuels such as oil, gas and coal, and if we did not run out of fossil fuels first, we would face serious environmental consequences from burning them.

Today, there has been a complete turnaround in the global energy picture. As we will see in the following pages, vast new reserves have been discovered in many countries, while technological advances allow for much more efficient extraction and recovery methods. Coupled with the energy conservation measures put in place over the last forty years and continuing development of alternative and renewable fuels to address a looming global shortage of energy, the world can look to a future where energy is no longer a scarce resource or a weapon to use against political adversaries.

In an ironic twist, after many years of being criticized for consuming more than its fair share of the world's limited energy resources, the US is now relatively self-sufficient in energy and a net exporter of energy since 2011 (see Chart 1 on the following page). A major share of the world's accessible unconventional energy reserves is located in the US, which means the nation is positioned to become a leading global energy supplier.

What caused this dramatic change of fortune? Chart 2 shows the share of energy derived from both conventional and unconventional energy sources in different regions of the world. We see that North America leads the world in recovering energy from unconventional sources. Canada is a leader in extracting oil and gas from tar sands, while the US is a pioneer in recovering oil and gas trapped in shale deposits deep below the earth's surface.

Unconventional reserves are more difficult and more costly to access than conventional oil and gas deposits, but the combination of high global energy prices and technical advances have now made the recovery of oil and gas from shale commercially viable. With the benefit of hydraulic fracturing (fracking) techniques perfected by the US energy sector, the nation has access to an abundant supply of cheap natural gas that exceeds its forecast needs for the next 100+ years.

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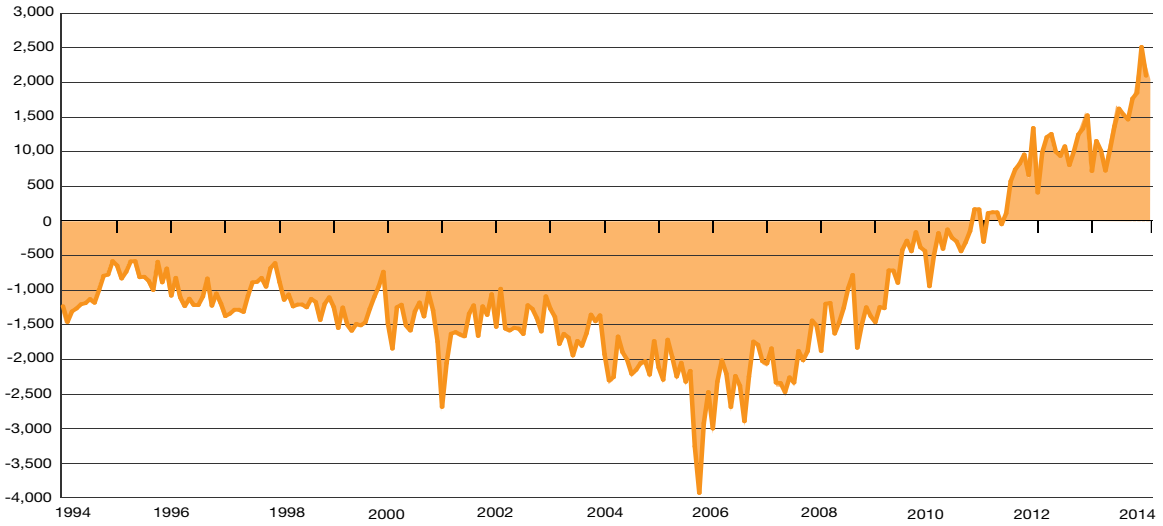
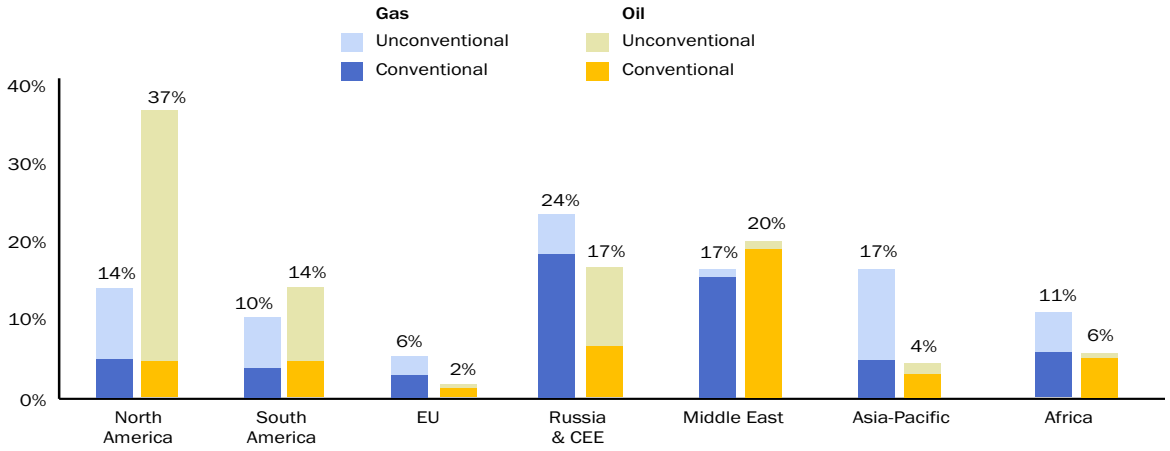
Chart 1. US Net Exports of Petroleum Products

(thousands of barrels per day)



Source: American Petroleum Institute, Energizing America, February 2014

Chart 2. Global Distribution of Accessible Oil and Gas Reserves



Source: Partners Group, The Energy Revolution and What This Means for America, March 21, 2014

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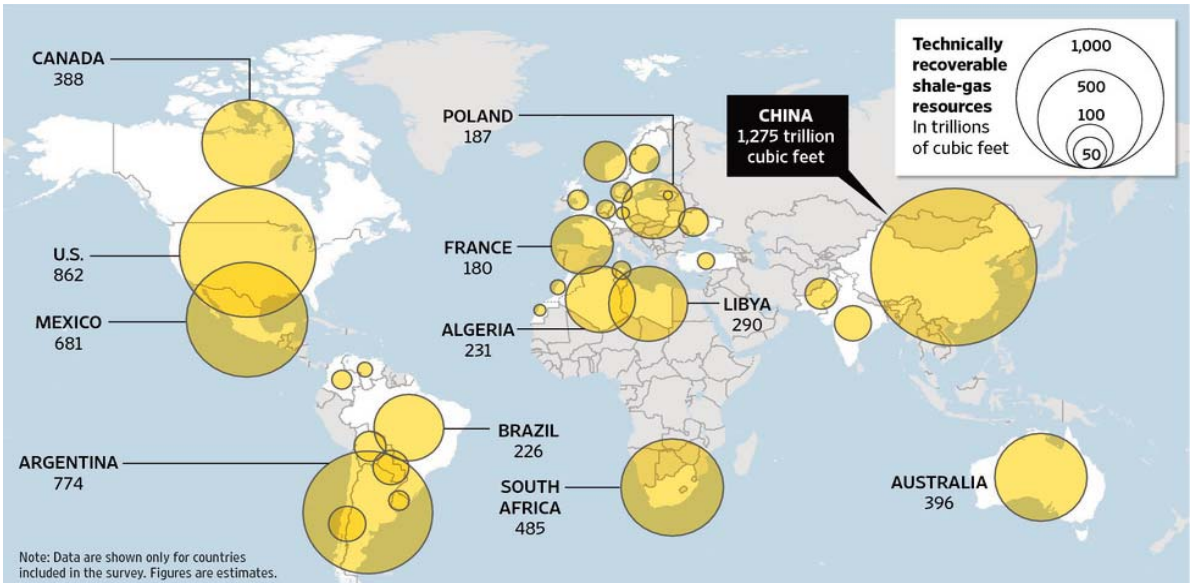
Chart 3. Biggest Global Shale Deposits



Source: Gold & Kruk, Global Gas Push Stalls, The Wall Street Journal, December 3, 2012

Chart 3 above shows that many other countries possess comparable or larger shale reserves than the US. So what gives the USA any particular advantage over other nations? The US wins out in a number of critical respects:

1. In most countries, mineral rights belong to the state, not to the landowner. The US gives property owners rights to mineral resources below their land.

2. The US has a long history of wildcatters and entrepreneurs who undertake risky exploration work in quest of riches.

3. The US pioneered essential techniques such as horizontal drilling and hydraulic fracturing that allow these deep resources to be extracted profitably.

4. Our deep capital markets make financing for risky exploration and drilling work accessible through banks, venture capitalists and a myriad of private firms.

5. A significant portion of the world's drilling infrastructure is based in the US and readily available for hire on competitive terms.

6. Unlike other countries, the US has no need for foreign investment or foreign know-how in order to exploit its shale resources.

The combination of these factors is a huge competitive advantage for the US, and to a lesser extent, Australia and Canada. Most other countries with large shale reserves (Chart 3) face specific challenges:

1. China possesses the largest estimated reserves, but it is least likely to benefit from the shale revolution for two critical reasons. First, due to unfavorable geology, China's shale reserves are not easily accessible. Second, China lacks sufficient water resources, an essential component of the hydraulic fracturing process.

2. Mexico's physical proximity to the US and its participation in NAFTA are a big plus. However, the state-owned monopoly Pemex has struggled even to maintain production from conventional sources. Unless the laws are changed to allow private companies to participate in the energy sector, Mexico is unlikely to do much with its unconventional reserves.

3. In Argentina, foreign investors were scared away by the 2012 expropriation of Spanish company Repsol's stake in the local energy firm YPF and the government's continued mismanagement of the economy. Investors are shying away from Brazil for similar reasons.

4. France, Romania and Bulgaria have outright banned fracking for environmental reasons.

5. Poland made a concerted effort to develop its unconventional reserves in order to lessen its dependence on Russia for energy. However, the repeated failure of its international partners to find shale gas in commercial quantities has caused Poland to curtail its development plans.

6. Ukraine's development partners have put their plans on hold following Russia's annexation of Crimea amid uncertainty over the future.

7. Libya experienced considerable disruption to its energy sector in the aftermath of the Arab Spring. Until some measure of political and economic stability is restored, it will be difficult for them to attract needed international investment to develop their unconventional resource base.

8. Algeria is keen to develop its uncoventional resources as production from its conventional fields is on the decline. However, onerous contract terms applied to foreign companies have prompted investors to sit out the last three contract bidding rounds. The January 2013 militant attack on its Amenas gas production facility has also made investors nervous about security.

9. South Africa's mining sector is heavily dependent on coal and imported oil, but it has been slow to develop its unconventional resources. A moratorium on fracking has been lifted, but exploration has been stalled by continuing regulatory uncertainty and environmental concerns.

Mechanics of Fracking

Conventional oil and gas deposits are pooled in sub-surface reservoirs that can be extracted by drilling a well below ground. By contrast, shale gas and shale oil are embedded in shale rock formations much deeper below the earth's surface and thus cannot be extracted conventionally. To extract the gas or oil from the shale, the rock formation first has to be fractured, or fracked.

Fracking combines two discrete processes, hydraulic fracturing and horizontal drilling. Combining hydraulic fracturing with horizontal drilling created the breakthrough that allows drillers to extract oil and gas trapped inside very deep rock deposits at commercially viable cost. Chart 4 on the following page illustrates the difference between conventional drilling and unconventional drilling.

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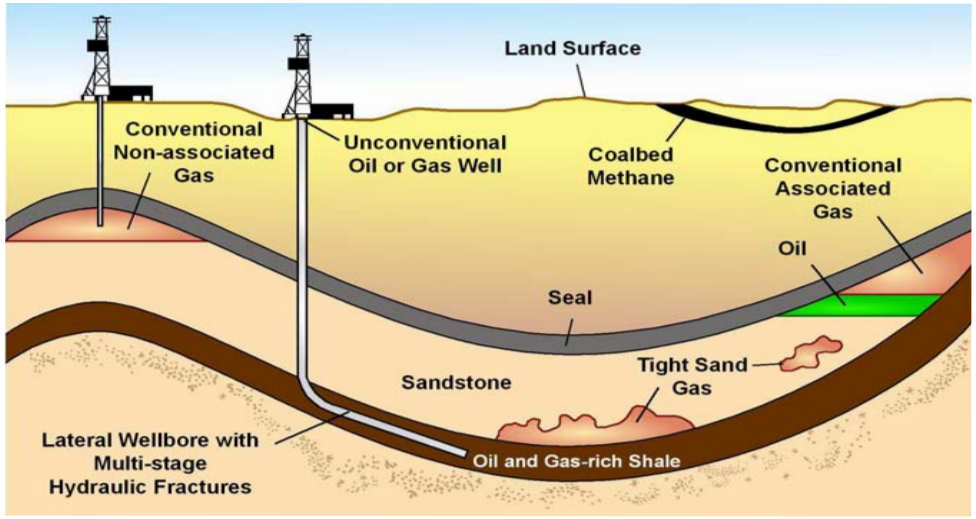
Chart 4. Conventional vs. Unconventional Drilling



Source: Charles Morris, World Economic Roundtable, New America Foundation, July 18, 2013

The fracking process begins by first drilling down vertically for 6,000 to 12,000 feet and then drilling horizontally for 5,000 to 10,000 feet. Next a fracturing fluid (typically 90% water, 9.5% sand and 0.5% chemical additives) is blasted into the rock formation at high pressure to dislodge the oil or gas trapped inside the rock. The sand plugs the blast holes and enables the resulting oil or gas to flow to the wellhead at surface level, along with 20% to 25% of the fracking fluid. Once it reaches the surface, the oil and gas are separated for processing and the residual fracking fluid has to be disposed of properly as it is now heavily contaminated.

Environmental, Health & Safety Issues

The rapid growth of fracking has given rise to objections on health, safety and environmental grounds. We will cover some of the key concerns below.

1. Residents of communities where fracking takes place have often complained of serious illnesses that they attributed to fracking activity. The facts are often in dispute, but fracking is banned in New York State, Wisconsin and certain US communities, as well as in France, Bulgaria and Romania.

2. One big objection to fracking has been the potential for contaminating municipal water supplies. However, since fracking activity takes place several thousand feet below the aquifers that supply water and contaminated water cannot flow thousands of feet upwards against gravity, it appears that human error, well malfunction, inferior well construction and improper waste disposal are the probable causes of any leaks or spills.

3. North Dakota officials discovered hundreds of trash bags containing radioactive waste that had been dumped improperly in remote Noonan and Watford City. The trash bags contained used oil socks, the absorbent filters used to filter used fracking liquid, and traces of radium. State officials quickly passed regulations requiring the use of leak-proof containers to store oil socks at well sites before transportation to authorized disposal facilities. (Dawson, Chester. "Radioactive Waste Is North Dakota's New Shale Problem." *The Wall Street Journal*, 16 April 2014).

4. Another major objection to fracking has been over seismic disturbances. Investigations have linked seismic events to deep well injection of waste water at high pressure, rather than the fracturing process itself (Lipschultz, Marc. "Historic Opportunities from the Shale Gas Revolution." *KKR Report*, November 2012).

5. Over 10% of all the crude oil produced in the US is transported by rail, due to the lack of pipeline capacity. Following train explosions at Lac Megantic, Quebec in July 2013 and Casselton, North Dakota in December 2013, the US Transportation Department and the railroads

have agreed that trains carrying crude oil will follow the same routing rules applied to explosives, radioactive materials and other hazardous cargoes shipped by rail. (Mouawad, Jad. "Despite Rise in Spills, Hazardous Cargo Rides Rails in Secret." *New York Times*, 15 April 2014).

6. Methane, a major component of natural gas, is a potent greenhouse gas. A new report in *Proceedings of the National Academy of Sciences (PNAS)* indicates that the Environmental Protection Agency has vastly underestimated the amount of methane emissions from natural gas. (Caulton et al. "Toward a Better Understanding and Quantification of Methane Emissions from Shale Gas Development." *PNAS* 14 April 2014). If these findings are confirmed, natural gas will no longer be considered a clean fuel that can bridge the transition from dirty fossil fuels while clean fuel technologies are being developed.

7. A single well can consume anywhere from 3 to 5 million gallons of water. As water scarcity becomes a growing problem for many communities, the amount of water required for fracking is a rising source of contention.

8. Other common objections to fracking activity have included complaints about round-the-clock noise and truck traffic, as well as wear and tear on roads and surrounding communities.

It is clear that the rapid growth of shale energy has outpaced the ability of local communities and regulators to put proper safety procedures in place. Many small entrepreneurial firms lack the financial resources or internal processes and controls to police themselves effectively.

As the sector develops and bigger firms come to play a larger role, we expect that many of these issues will be addressed. However, given some of the risks we outlined, more effective regulation will be necessary to ensure that the sector's rapid growth is not derailed by a safety or environmental disaster.

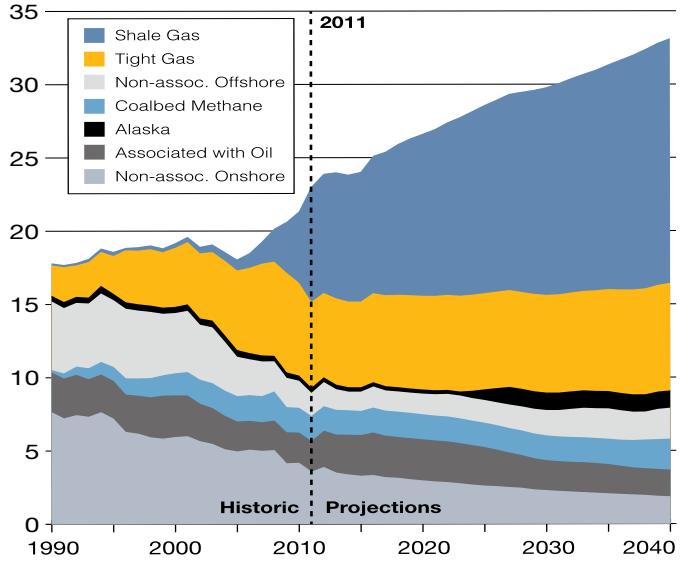
Supply/Demand and Infrastructure Considerations

The US is forecasted to benefit from the recovery of huge quantities of shale gas, tight gas and tight oil over the coming years, dwarfing the amount expected to be recovered from more conventional sources.

Charts 5 and 6 illustrate the respective contributions from shale gas and shale oil versus other sources. The following definitions might be useful as you look at these charts:

1. Tight gas refers to natural gas dispersed within silt or sand, while shale gas refers to natural gas trapped in sedimentary rock. However, the same drilling techniques are used to recover tight gas and shale gas.

Chart 5. US Dry Gas Production by Source
(trillion cubic feet per year)



Source: US Energy Information Administration Annual Energy Outlook 2014

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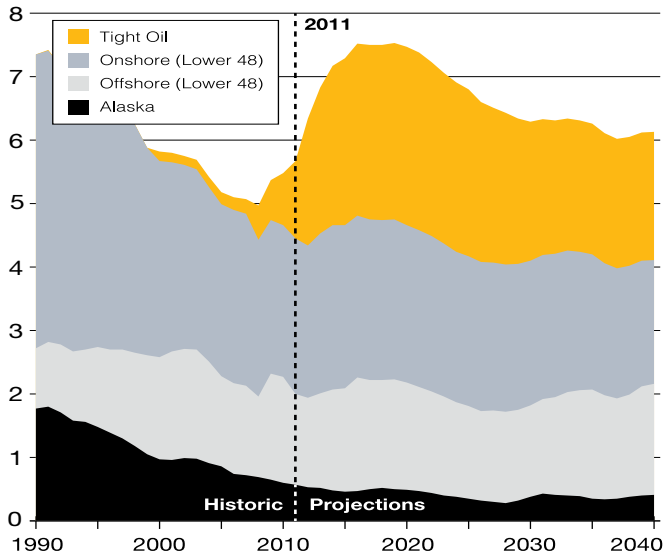
2. Tight oil is synonymous with shale oil. It refers to conventional crude oil trapped in shale rock from which it cannot flow freely.

Chart 6. US Crude Oil by Source
(million barrels per day)

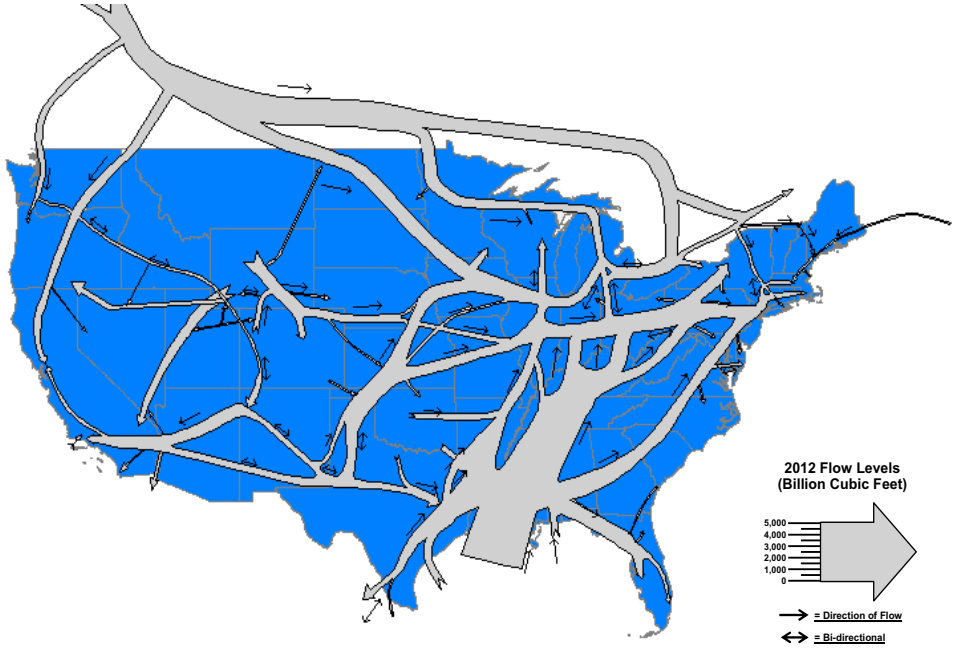


Source: US Energy Information Administration Annual Energy Outlook 2014

With abundant supplies of both shale gas and shale oil, the US enjoys a large pricing advantage compared to Asia and Europe. For example, West Texas Intermediate (the US crude oil benchmark) traded at $103.83 per barrel on April 15 at its Cushing, Oklahoma hub represents a $4.91 per barrel discount to the $108.74 per barrel price for Brent Crude, the international benchmark. Similarly, the April 15 Henry Hub spot price for US natural gas was $4.56 per million Btu, compared to $10.88 in Europe and $15.70 in Japan, where natural gas contract prices are linked to oil prices. We expect that rising US production will only widen the pricing gap, conferring a huge advantage on US industry and US consumers.

Currently, the US lacks much of the necessary infrastructure to extract, transport and store all of the oil and gas that will be coming out of the ground. As we see in Chart 7, the US supply chain was designed to import vast quantities of oil and gas, process the raw products at coastal refineries and ship the refined products to end markets inland. Conversely, the new reserves are sited in the interior of the country, far from both existing refining hubs and end markets. In fact, one of the reasons for the price differential between WTI and Brent crude largely has been the continuing backlog of crude oil inventories at Cushing, Oklahoma because of surging production and insufficient refining and pipeline capacity.

Chart 7. Principal Interstate Natural Gas Flows
(2012)



Source: Natural Gas Annual, US Energy Information Administration, Office of Oil, Gas and Coal Supply Statistics, December 2013

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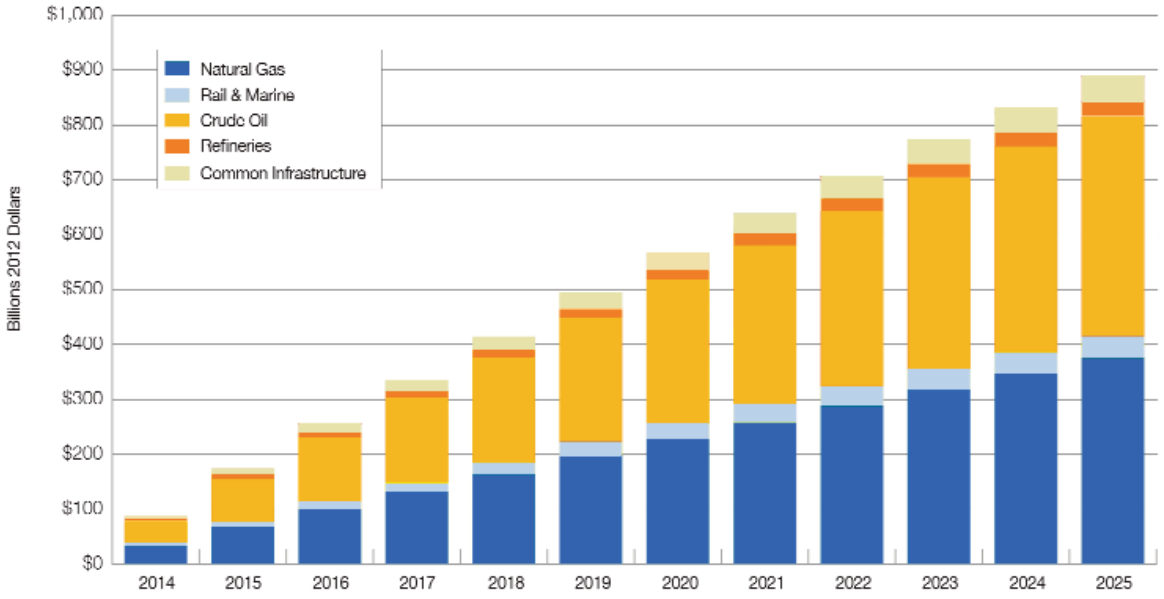
Chart 8. Cumulative Spending on US Infrastructure



Source: American Petroleum Institute, Energizing America, April 2014

Furthermore, the existing US refinery infrastructure is not designed to process the heavy sour crude that is imported from the Middle East, Venezuela and Nigeria. The US currently produces copious amounts of light sweet crude, which is processed differently. And to complicate matters further, following the Arab oil embargo, Congress passed the Jones Act to conserve energy and prohibit the export of crude oil. Unless refineries are retooled to process light sweet crude and regulations are changed to allow exports, the US will face a growing glut of crude oil.

A comparable situation affects natural gas. The US produces more natural gas than it can consume, but it lacks the ability to export the surplus gas. Typically gas is converted to liquefied natural gas (LNG) before it is transported by ship. Historically, the US imported LNG, gasified it at coastal terminals and piped the gas to markets inland. Now it has to find a way to reverse this flow.

To fill these gaps, the American Petroleum Institute estimates that the nation will need to spend a total of $890 billion on infrastructure development between now and 2025 (Chart 8).

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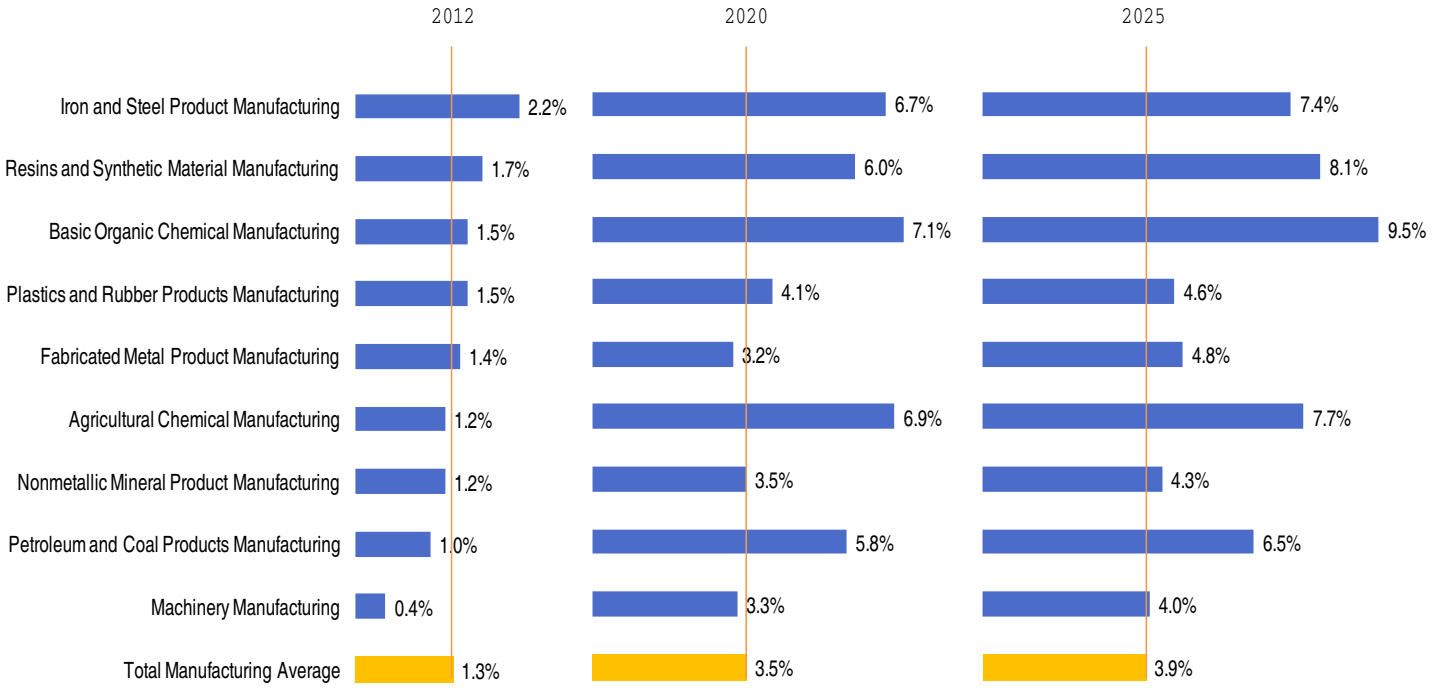
Impact of Fracking on US Economy and US Industry

Next, let us review which parts of the US economy are likely to benefit the most once the oil and gas starts flowing. Chart 9 shows that in manufacturing, the chemical and metals sectors will experience the greatest impact, as companies seek to locate energy-intensive facilities close to cheap energy hubs.

Already companies are repatriating jobs back to the US to take advantage of the powerful combination of cheap energy, competitive labor rates and more flexible workforce. This has the potential to transform the future prospects for the entire US manufacturing sector.

Chart 9. Economic Effect on US Industry Sectors



Source: IHS Global Insight, America's New Energy Future Vol 3: A Manufacturing Renaissance, September 2013

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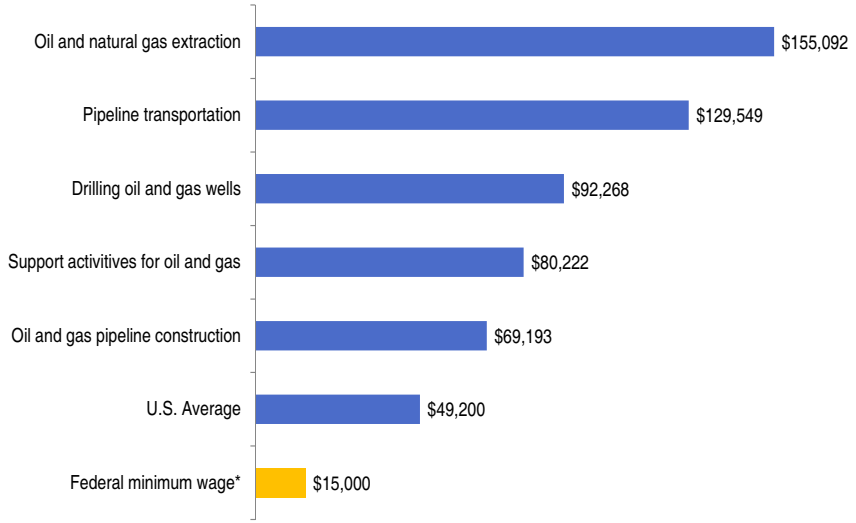
According to private equity firm KKR, by 2017 the energy boom will create 330,000 new jobs in energy, 120,000 to 210,000 jobs in manufacturing and 33,000 to 40,000 jobs in construction (Lipschultz, Marc. "Historic Opportunities from the Shale Gas Revolution." *KKR Report*, November 2012). Encouragingly, many of the new jobs, particularly those in the energy sector, will command high salaries. Chart 10 shows average salaries for representative jobs in the energy sector, and how these compare to the US average wage.

Chart 10. Average Annual Wages for Oil and Natural Gas Jobs



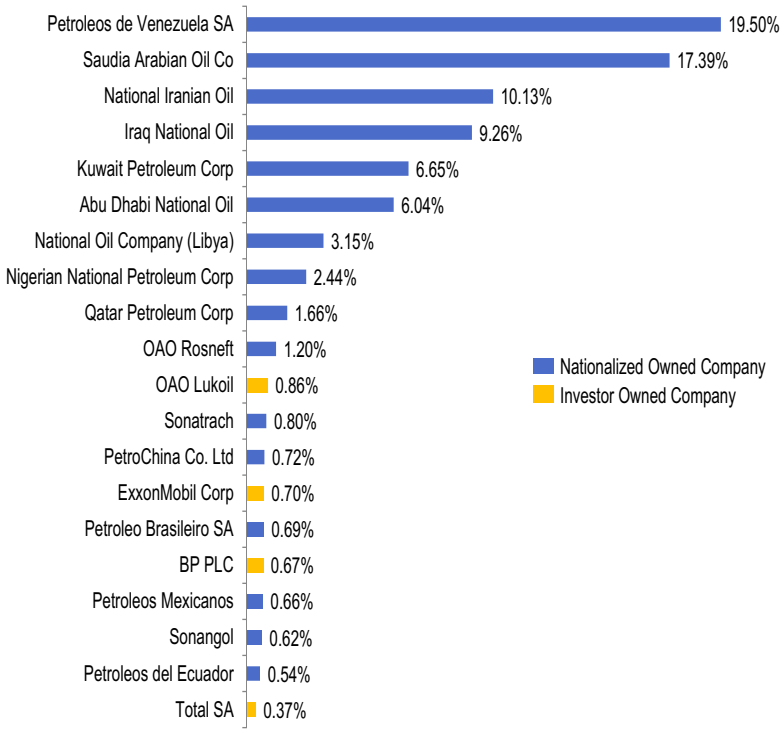
Source: American Petroleum Institute, Energizing America, April 2014

To gauge the overall GDP impact of the shale revolution, our research partners at ISI Group believe it will add an incremental 0.3% to US GDP each year, compounded annually for the foreseeable future.

Geopolitical Considerations

The following charts show the owners of the world's largest conventional oil and gas reserves, respectively. As we see, the bulk of the world's conventional oil is in government hands, with less than 2% in private hands. The picture is little better for gas, with 3.3% in private hands.

Chart 11. Largest Oil Company by Global Share of Proven Reserves
(2012)



Source: American Petroleum Institute, Energizing America, March 2014

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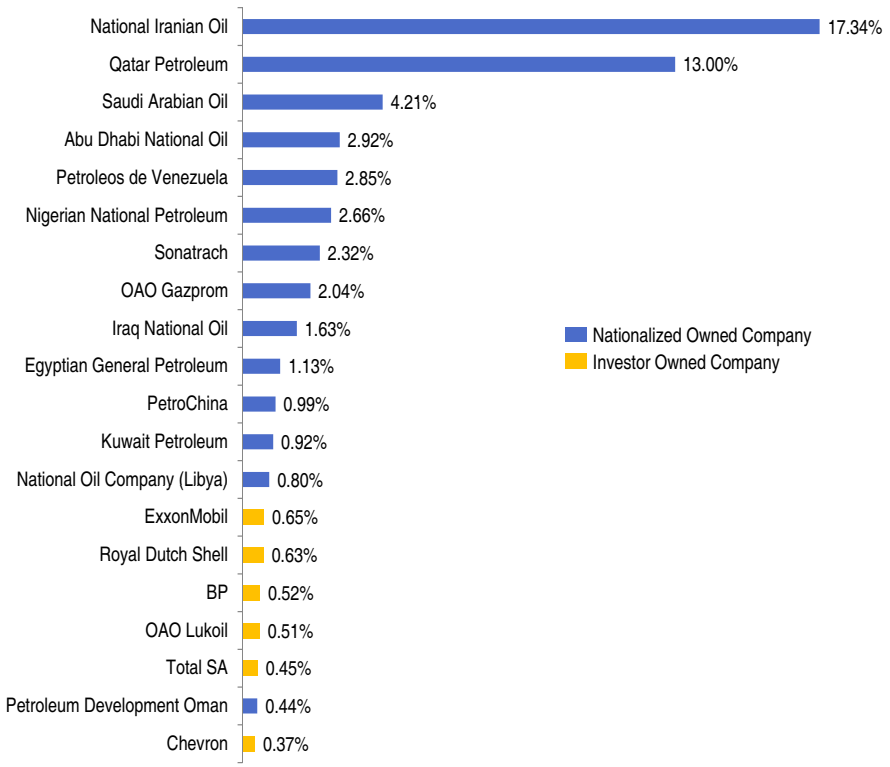
Chart 12. Largest Natural Gas Companies by Global Share of Proven Reserves
(2012)

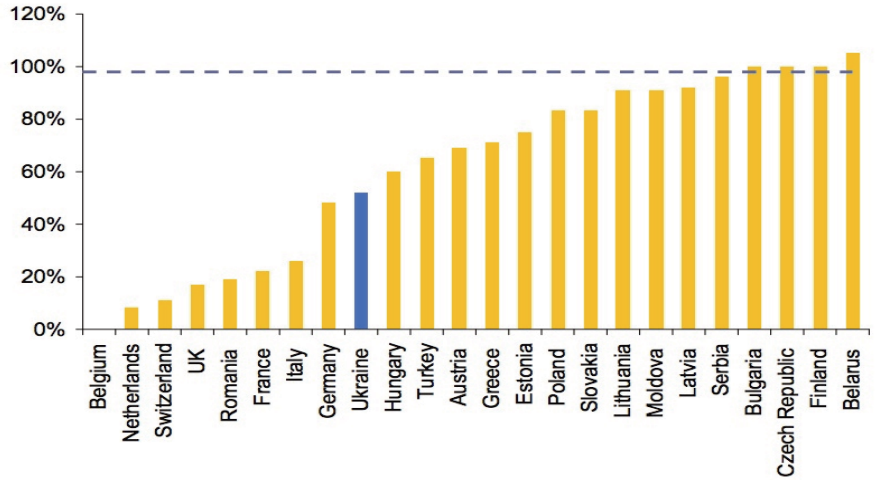


Source: American Petroleum Institute, Energizing America, March 2014

The importance of this last point can be appreciated as we consider the current situation in Europe. Our 2014 Outlook flagged the developing conflict between Russia and Ukraine as a major geopolitical flash point for 2014. Russia's subsequent annexation of Crimea, its efforts to destabilize Ukraine ahead of the May elections and Putin's proclamation of a sphere of influence over the former Soviet Union have all raised fears that a takeover of Ukraine will be followed by incursions into the Baltic states, all on the pretext of protecting their sizable Russian populations.

Despite the conflict taking place on its doorstep, the European Union has not imposed any meaningful sanctions on Russia, which is understandable in the context of Europe's heavy dependence on Russia for its energy needs. Overall, Russia supplies 35% of Europe's gas supplies, but the figure is far higher for certain countries (Chart 13) and Russia has shown that it will not shy away from cutting off gas supplies or raising gas prices to achieve its political goals. Although the chart below suggests that Ukraine is not as reliant on Russia on gas as its neighbors, 53% of Russia's gas exports to Europe flow through Ukraine; hence the need to keep Ukraine under Russian control.

Chart 13. Percentage of Natural Gas National Consumption Supplied by Russia



Source: Morgan Stanley Research via Business Insider, March 4, 2014

Unfortunately, there is no near-term solution to Europe's problem. There is considerable opposition to fracking across the region. Even if France and the other countries with large shale deposits overcome their resistance to fracking, it will take several years to get to the commercial extraction stage. Until then, Europe will remain vulnerable to potential supply or price disruptions from Russia.

Ironically, in spite of its environmental concerns related to fracking, Europe has recently switched to using more coal as a cheaper alternative to gas. Additionally, following the Fukushima disaster in 2011, a number of countries such as Germany, Italy and Switzerland have scaled back their commitment to nuclear power and are also turning to coal. Among the three primary fossil fuels, coal is the dirtiest (see Chart 14), so the growing use of coal is a step backwards for the environment.

Chart 14. Fossil Fuel Emission Levels
(pound per billion Btu)

Pollutant	Natural Gas	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000
Carbon Monoxide	40	33	208
Nitrogen Oxides	92	448	457
Sulfur Dioxide	1	1,122	2,591
Particulates	7	84	2,744
Mercury	0.000	0.007	0.016

Source: Natural Gas Issues and Trends, US Energy Information Administration via NaturalGas.org

Winners, Losers & Bystanders

US: The US will be a clear winner on many fronts. First, it will be less beholden to unfriendly or unsavory suppliers. Second, studies indicate the shale resource base is so large that domestic prices will barely be affected by large-scale exports to other countries. As a major exporter, the US will be well positioned to counteract any future attempts by other countries to use energy as a strategic weapon. Third, the US manufacturing and chemicals sectors will benefit directly from access to cheap energy, while the broader US economy will benefit from the boost to economic activity and jobs.

Here is how the shale revolution will affect other key global players:

OPEC: OPEC currently has the power to set the prevailing oil price by adjusting production up or down to maintain a stated fair price. In practical terms, the fair price reflects the price level required for member countries to balance their budgets, or keep their populace from getting too restive. Going forward, OPEC will find it more difficult to control pricing, as abundant energy supplies will be available to cover any cutbacks by OPEC. And, unless the new producers join OPEC, its sphere of influence will be diluted as more countries develop their shale resources.

Canada: Canada is the biggest energy supplier to the US and much of its distribution network is geared to supplying US customers. As the US becomes more self-sufficient, Canada will need to find new customers for the oil and gas it ships to the US today. Asia will be the likely choice, but it will require Canada to build new facilities to transport oil and gas from Alberta or the Arctic region to Canadian ports for shipment to Asia.

Middle East: As the US becomes less reliant on imported energy, the Middle East will have less sway over US defense and foreign policy decisions, but this does not mean the US will, or can, walk away from the region. The Mideast will remain strategically important for two reasons. First, a significant portion of the world's oil supply will continue to flow through the Straits of Hormuz and second, surging demand from China and developing Asia will provide a ready market for Mideast oil.

China: Already the world's largest importer of energy, China will need ever-larger amounts of oil and gas to achieve its growth targets. Since it does not have readily accessible shale reserves, or sufficient water to develop these resources, China will remain a net long-term importer. China has an urgent need to reduce urban pollution, which will require it to source large quantities of cleaner energy.

Russia: Russia has made a concerted effort to lock in European countries as buyers of Russian gas and discourage them from developing their domestic resources. Now, Russia stands to lose its leverage, as these European nations seek out less risky sources of supply. Russia also requires oil prices to remain high as a way of balancing its budget.

An alliance between Russia and China could represent a potential "nightmare scenario" for the West. Russia has substantial gas capacity to sell, while China needs access to a cleaner alternative to coal to help reduce its growing pollution problem.

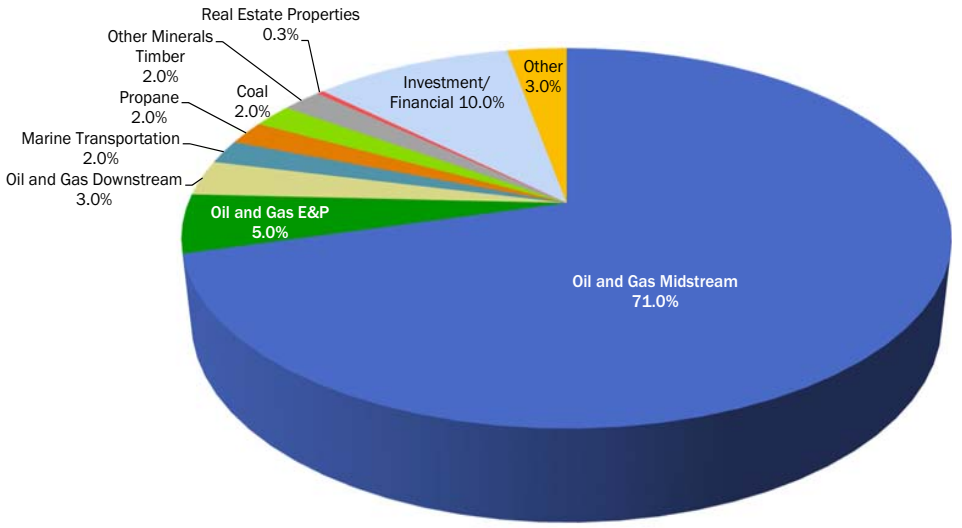
Investment Positioning

The US investment markets will reap considerable benefit from the shale revolution. In large cap equities, we believe that companies in the energy, chemicals and industrials sectors will benefit directly, while companies in the consumer discretionary arena will benefit indirectly, through the pickup in overall economic growth. In small cap equities, we believe smaller energy companies that fund much of the risky initial exploration work will also do well. In the fixed income arena, high yield bonds used to finance smaller exploration and drilling companies could benefit from the activity in this sector.

Another investment category well positioned to benefit from the shale revolution is master limited partnerships, or MLPs. These are publicly traded vehicles that trade like a stock, but avoid tax at the corporate level due to the partnership structure. Like REITs, MLPs pay out a large share of their earnings to investors. Additionally, a significant portion of the income distributed can be tax-deferred, as it is shielded by depreciation on the underlying assets. Hence, MLPs can have attractive yields compared to equities.

There are 130 MLPs currently traded, of which 106 or 82% are focused on energy and natural resources. Within the oil and gas sector, pipeline and infrastructure (midstream) accounts for 71% of the aggregate market capitalization of all MLPs, while exploration & production (upstream) represents 5% of the aggregate investment and refining (downstream) makes up 3% of the total. Given this history, MLP may be a logical vehicle for deploying all the capital that is projected to flow into the energy sector.

Chart 15. MLP Market Capital by Sector



Source: Understanding MLPs, National Association of Publicly Traded Partnerships, October 4, 2013

With MLPs, a portion of the distributions received by investors may be a return of capital. If the distribution amount is greater than the corresponding income, investors will find their basis in the partnership depleted, triggering a large taxable gain if the holding is sold. For this reason, MLPs are marketed as an effective estate planning tool, due to the step-up in basis at the holder's death.

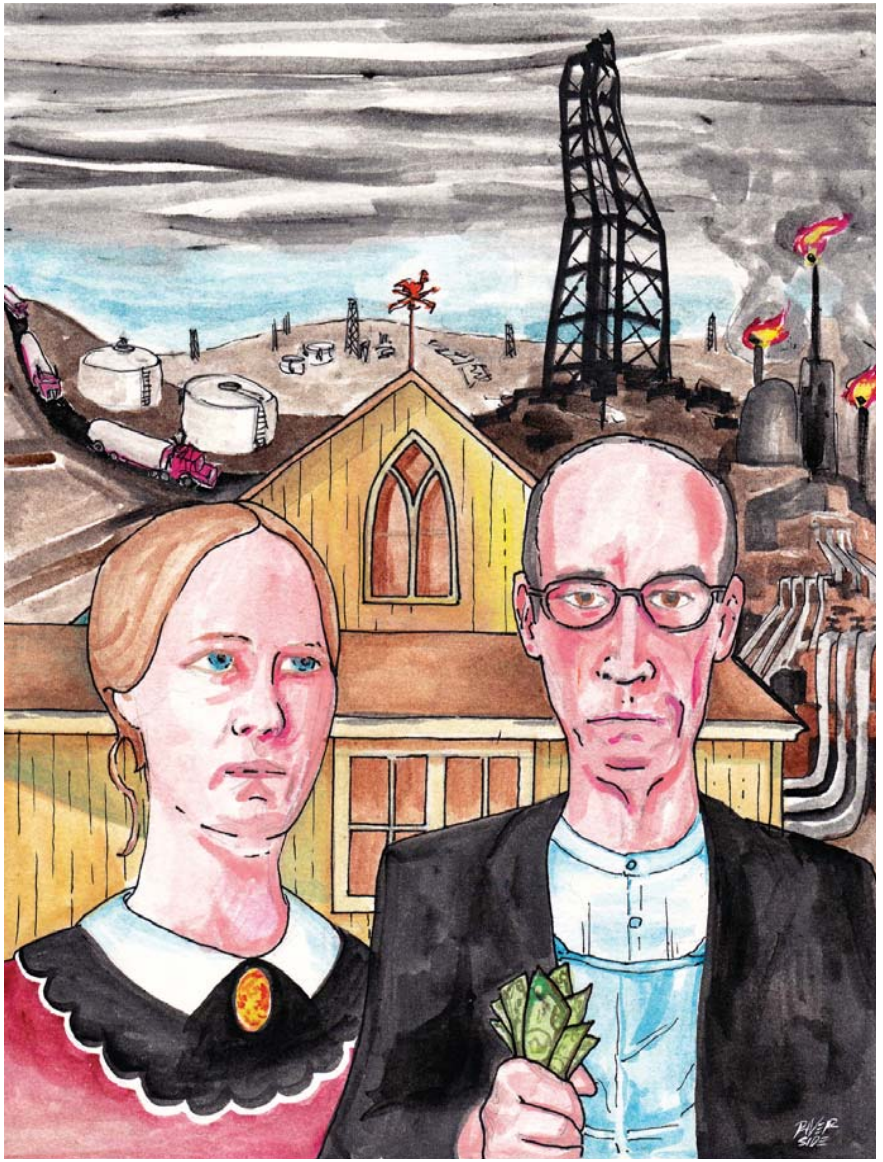
In our view, the step-up in basis at death is not unique to MLPs and the adverse tax consequences of selling a highly appreciated holding with zero basis is a major impediment to owning these structures, especially if it precludes investors from selling their holdings for tax reasons. However, based on the expectation that MLPs will be central to the build-out of the energy sector, we will continue to monitor the category closely. And if it still makes sense to include MLPs in our investment programs, we will do so.

Conclusion

In summary, the shale revolution provides the US with numerous benefits. It presents a rare, and transformative, opportunity to develop a secure long-term supply of cheap domestic energy; create a growing pool of well-paid jobs; and helps revive our troubled manufacturing sector, while reducing our dependence on inhospitable supply sources. Besides the direct impact on the energy, chemical and manufacturing industries, we expect that the broader US economy will also benefit from the indirect impact of the shale boom.

As indicated, a huge investment in infrastructure and exploration will be required to bring all of this to fruition. Additionally, the fracking industry will have to overcome opposition from communities and provide assurance that adequate safeguards are put in place to protect residents from the many health, safety and environment risks we have outlined in this report.

We believe the shale revolution will be very much a US phenomenon in the near to mid-term, due to a confluence of geological, technological, investment and legal factors that we detailed above, and it may take a while for other countries to replicate these conditions. If the US is successful, the beneficial impact on the US economy will allow the nation to maintain to its global standing for considerably longer than current predictions.



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First Quarter Performance Summary

Asset Class	Benchmark	1Q14 Return	YTD Return	Performance Summary
Cash	Citi 3-month T-bill	0.01%	0.01%	Cash yields will remain low for the foreseeable future.
Domestic Gov't / Agency	BC U.S. Gov't & Related 5-7	0.64%	0.64%	Early concerns about slowing US economic growth were overcome as Treasurys regained their safe haven status on news of geopolitical conflict. Yields on the benchmark 10-year Treasury note fell from 3.03% at year-end 2013 to 2.73% at quarter-end, leading to lower rates in other markets priced off Treasury spreads and muting the impact of continued Fed tapering, as its monthly purchases fell to $55 billion by March from $85 billion in December.
Domestic Tax-Exempt	BC Municipal Bond 5-Year	1.00%	1.00%	Strong demand and a shortage of new issuance kept muni returns positive despite the usual March sales to fund tax payments. The market shrugged off President Obama's call to limit the tax exemption to 28% for high income earners, suggesting a low likelihood that the provision would be passed by Congress.
TIPS	BC TIPS	1.95%	1.95%	Inflation expectations remain muted, falling from 2.69% at year-end 2013 to 2.45% at quarter-end. TIPS returns were boosted by the flatter yield curve, which benefitted longer dated bonds.
Investment-Grade Debt	BC Inv. Grade Intermediate	1.63%	1.63%	Corporate bonds benefited from lower Q1 rates as well as credit spreads tightening to a new low of 103 bps over Treasurys. Despite record new issuance of $120 billion in March, demand for corporate bonds remained strong.
High-Yield Debt	BC High-Yield Intermediate	2.83%	2.83%	High yield spreads approached historic lows in Q1, a cautionary sign for valuations. Bank loan returns lagged high yield returns due to their lower durations. Demand for both high yield and floating rate bonds remained strong from investors seeking higher yields.
Global Bonds	Citi World Gov't Bond Index (Hedged)	2.66%	2.66%	On the presumption that the peripherals have turned a corner and that the ECB will continue to support the Eurozone recovery by keeping rates low, surging demand dropped peripheral yields to levels comparable with safer havens such as Germany.
Emerging-Markets Debt	Morningstar EM Composite Bond Index	3.01%	3.01%	Improved current account positions and higher rates in local markets added to the relative attractiveness of EM local currency bonds versus USD-denominated bonds, which felt the impact of lower US interest rates.
Large-Cap Equity	S&P 500	1.81%	1.81%	Q1 was a volatile quarter, with the index posting several record closings before settling back to a modest 1.8% gain for the quarter. Economically sensitive consumer discretionary stocks fell 2.8% for the quarter, reflecting harsh weather conditions while defensive stocks posted strong returns, especially health care (+5.8%) and utilities (+10.1%), which benefited from lower rates.

First Quarter Performance Summary (Continued)

Asset Class	Benchmark	1Q14 Return	YTD Return	Performance Summary
Small/Mid-Cap Equity	Russell 2000	1.12%	1.12%	Small cap equities mirrored the return pattern for large cap stocks, with utilities (+5.4%), information technology (+5.0%) the leading sectors, while consumer discretionary (-3.15%) was the only sector with negative performance. Health care stocks (0.8%) were hurt by profit-taking on biotechs and new issues.
International Equity	MSCI EAFE	0.84%	0.84%	Small cap EAFE (+2.3%) continued to outperform large/mega cap EAFE (-0.2%). Italy (+15.0%), Portugal (+14.9%) and Ireland (+10.2%) were among the top performing markets, reflecting growing confidence in the peripherals' recovery.
Emerging-Markets Equity	MSCI EM	-0.53%	-0.53%	Emerging markets had another weak quarter, driven by Russia/Ukraine political tensions and the continuing slowdown in China. Russia (-14.7%) was the worst performing market, followed by Hungary (-8.6%) and China (-5.2%). Chinese stocks and copper prices (a common barometer of EM health) stabilized late in Q1, suggesting a potential turning point for EM equities.
Real Estate	DJ Composite REIT Index	7.76%	7.76%	REITs posted strong performance as improving economic conditions and lower interest rates helped boost valuations. Apartments, self-storage and lodging REITs were strongest categories in Q1.
Commodities	DJ UBS Commodity Index	6.98%	6.98%	Commodity prices rallied in Q1, mainly due to steep rises in February on fears of supply restrictions and fallout from the Russia/Ukraine conflict. Prices eased in March, amid signs that the conflict could be contained. Weaker demand from China caused weakness in cyclically sensitive commodities, with copper prices down 5.4% and 9.7% YTD. Continued Fed tapering and the expectation of higher interest rates put downward pressure on precious metals.
Private Equity	S&P Listed Private Equity	1.34%	1.34%	Both fund raising and deal activity remained strong in Q1. One hundred and eighty-five funds raised an aggregate $98 billion in Q1, with energy, technology and real estate the favored sectors. Q1 saw 688 completed buyout deals with an aggregate value of $80 billion. IPO activity was also strong, with 237 offerings raising an aggregate $44.1 billion. Asia accounted for 41% of all deals, including 7 of the 20 largest IPOs.
Hedge Funds	HFRX Global Hedge Fund Index	1.11%	1.11%	Hedge funds posted their best performance since 2010. Equity and credit-oriented strategies did particularly well in 2013. Distressed and event-driven strategies delivered good returns. Despite the resurgent stock markets, equity hedged strategies also delivered strong returns for the year.

Source: Bloomberg; Data as of 3/31/2014