



the second leg of the US energy revolution

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Until recently, low commodity prices and high extraction costs made US shale gas and oil deposits uneconomic prospects. However, the recent increase in commodity prices combined with advancements in seismic technology, horizontal drilling and hydraulic fracturing, or fracking, techniques have changed the game for the world's second-largest energy consumer,ⁱ opening 100 billion to 200 billion barrels of oil and 1,000 trillion to 2,000 trillion cubic feet of natural gas reserves to development. Talk of US energy independence has now drowned out long-standing debates over depleted reserves, drilling in the Arctic National Wildlife Refuge and America's reliance on foreign oil.

KEY TAKEAWAYS

- The explosion in domestic hydrocarbon production has been a boon for the US economy.
- Peripheral benefits of the energy revolution are now in focus.
- Longer term, increased petrochemical production should join lower-cost energy and labor to boost domestic US manufacturing.

The explosion in domestic hydrocarbon production has been a boon for the US economy at a time when America, like other developed countries, is eager for real economic growth to take hold. For the past five years, natural gas prices have been near decade lows,ⁱⁱ and oil imports from OPEC nations are at multi-year lows. North Dakota, home to the prolific Bakken tight oil play, now boasts the lowest unemployment rate in the country at a miniscule 2.6%.ⁱⁱⁱ Other shale-producing states are also reaping impressive employment and GDP gains. By 2015, we estimate shale gas and oil will have generated about 3 million jobs in the energy sector.^{iv}

At this stage, we believe markets have digested the “aha” moment for shale energy: most scalable US shale plays have been found, and economic production has been largely proven. Investors are now concentrating on the second leg of the energy revolution. Looking ahead, we are focused on the peripheral benefits of this boom through lower energy costs for US manufacturing, as well as potential growth in the petrochemical industry, given the domestic glut of natural gas liquids.

PIPELINES & MASTER LIMITED PARTNERSHIPS (MLPs) ENJOY STRONG GROWTH

Following the increase in natural gas pipeline building prior to the Great Recession and the subsequent bust of natural gas prices, there were questions as to how the pipeline sector would grow in the coming decade. However, with the shale boom extending into natural gas liquid plays across the country, the MLP industry has continued to enjoy strong growth over the past several years.

Projects have ranged from massive pipelines, such as the proposed 1,700-mile Keystone XL pipeline expansion, to smaller pipelines and a large build out in capacity to process the “wet” natural gas. Capital expenditure for the largest pipeline companies shot from about \$17 billion in 2010 to a projected \$37 billion in 2014.^v Importantly, new pipelines and reversals of existing pipelines have connected Gulf Coast refineries with production from inland shale plays. We believe this connection should continue to give US refineries a leg up on international refineries by delivering a glut of crude to the Gulf Coast, where more than half of the country's refining capacity resides. Debate continues over the need for and the benefits of the crude oil export ban. In the meantime, domestic refineries should continue to benefit from the ban as the refiners consume the price-advantaged domestic feedstock and sell products like gasoline to global and local markets at a premium.



It's unclear just how long the acceleration in pipeline infrastructure growth can continue, but we see no signs of near-term slowing, and intermediate-term fundamentals and growth prospects for the sector appear sound. The low interest-rate environment remains a critical underpinning for growth, particularly for pipeline companies structured as MLPs.^{vi} The regular, and rising, distribution payments of the MLPs have been in steady demand from income- and yield-hungry investors. MLP issuance has grown dramatically as the partnerships tap equity and debt markets to fund the investment projects needed to increase distributions. Given the healthy backlog of growth, we expect this trend to continue. From an investor perspective, MLPs can be compelling, given the tolling arrangements with customers. Ten-year contracts with minimum volume commitments are common, and create a predictable income stream. And because MLPs typically do not take ownership of commodities, they are largely insulated from the price volatility that affects other energy-sector investments.

MLP stocks tend to trade at a significantly higher multiple than shares of the parent company. Assuming the valuation spread remains intact, the parent divests assets to the MLP at an attractive gain, and the MLP acquires the assets it needs to grow distributions below its valuation level. If the valuation spread were to narrow or reverse, sponsors may temporarily or permanently lose the opportunity to sell assets accretively to the MLP, which could negatively impact growth rates for the MLP and eliminate an attractive funding source for the sponsor. This symbiotic relationship helped MLP stocks perform very well as a group. For fixed income investors, the growing prevalence of MLPs over the past decade has earned pipelines greater representation in the Barclays Investment Grade Corporate and High Yield indices, making this type of investment an increasingly important area for many credit investors to consider.

PETROCHEMICAL INDUSTRY IS A CRUCIAL LINK FOR INVESTMENT OPPORTUNITIES

Petrochemical plants are springing up along the Gulf Coast as companies move to convert cheap natural gas and natural gas liquids (NGLs) into higher-value products, such as diesel fuel and ethylene. Ethylene, a chemical raw material used to manufacture everything from plastics to personal care products, is a good barometer for the petrochemical industry because of its broad application, and we see tremendous momentum in this market. Plans for ten new US ethane “cracker” facilities to produce ethylene have already been announced, and ten existing facilities intend to expand. These plans would raise US ethylene capacity to 41 million tons per year, a 52% increase from today's levels.^{vii} By 2020, the growing chemical sector could contribute 500,000 permanent jobs and 1.2 million temporary jobs to the US economy.^{viii}

The burgeoning petrochemical industry is a crucial link in a chain of economic and investment opportunities. Near term, US natural gas supply is projected to outstrip demand until at least 2017.^{ix} This should help keep prices for US ethane and other NGLs among the lowest in the world, creating a potential margin advantage that may lure petrochemical investment capital away from international markets.

REGARDLESS OF EXPORT STATUS, HIGHER US CRUDE PRODUCTION MAY NOT EQUAL LOWER GASOLINE PRICES

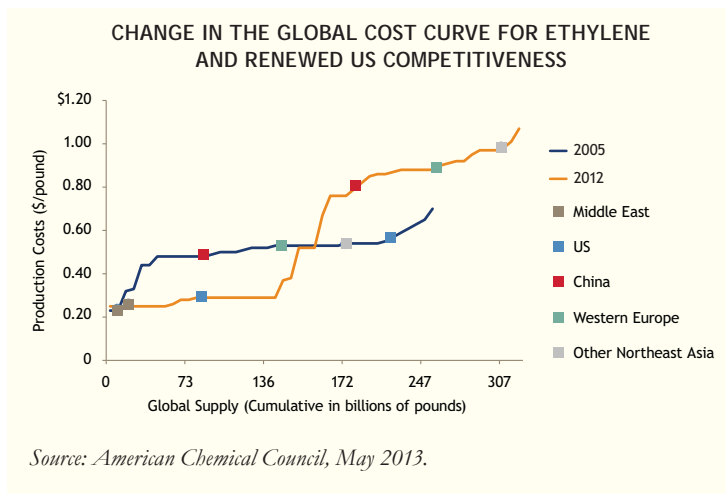
The surge in natural gas production lowered home heating costs dramatically over the past decade, a plus for US consumers. But shale oil lacks a consumer story. Though the US cannot export most crude, exports of refined products like gasoline and diesel are at unprecedented highs, according to data released by the US Energy Information Agency in May 2014. As long as oil products can be sold at international prices, domestic prices will not fall.

Would prices for oil and oil products change if the US reversed its decades-old ban on crude exports? Not in our view. Energy Information Administration (EIA) data as of December 2013, shows that despite regional gluts, the US and Canada still consume more oil than they produce. This net shortage means oil prices would be largely unaffected if US crude were sold internationally.

The export ban is being debated in Washington, but an outright reversal is unlikely, welcome news to refiners. However, energy companies are looking toward light processing of condensate as a way around the current law.



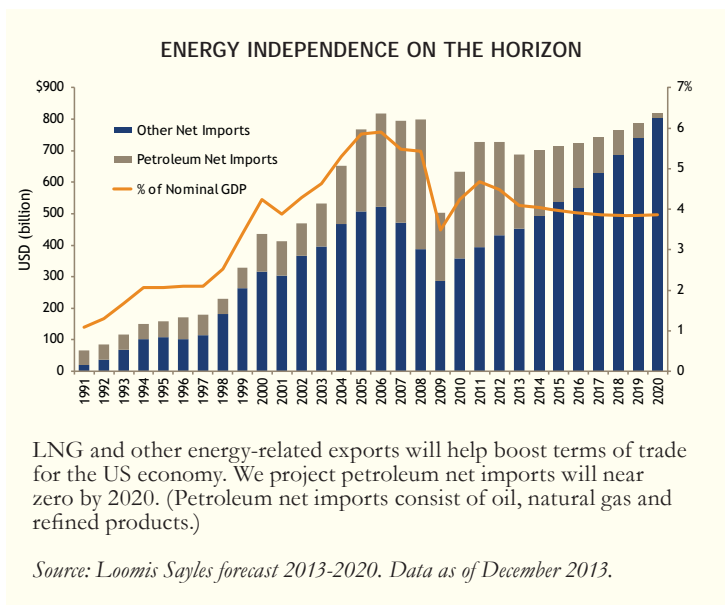
Currently, many petrochemical facilities in Europe and other parts of the world are not equipped to import US ethane, which should allow US-based operations to corner the cost advantage in the intermediate term. Eventually, we expect petrochemical demand for NGLs to spur a second wave of US shale play development, reversing the slide in exploration and production caused by falling commodity prices and less attractive drilling economics.



Longer term, increased petrochemical production should join lower-cost energy and labor to boost domestic US manufacturing. Raw materials like ethylene are now a relative bargain in America, as shown in the chart above. And US unit labor costs have been well contained amid productivity gains, while 15% annual wage inflation in China during the past decade^x has eroded that country's labor advantage. Foreign and domestic manufacturers eager to capitalize on these factors are funding projects in the US instead of Europe and Asia, helping America's manufacturing sector gain traction after a 40-year decline. Non-durable manufacturing, which has fallen steadily and currently hovers around 1997 production levels,^{xi} may be a leading candidate for growth. Key non-durable industries like chemicals, plastics and rubber products should garner 85% of the \$342 billion economic expansion projected to come from manufacturing as a result of the energy revolution.^{xii} And because manufacturing can employ a more diverse set of workers than the high-skill energy sector, it could yield larger, more diffuse economic benefits than the upstream effects of shale energy to date. We are particularly focused on rising productivity given the US's technology-intensive approach to manufacturing.

US SITTING ON 92-YEAR SUPPLY OF LIQUEFIED NATURAL GAS (LNG)

At 2011 consumption levels, the US is sitting on an estimated 92-year supply of natural gas.^{xiii} Trade approval and transportation are the tickets to capitalizing on these reserves, and companies have zeroed in on both. The US Department of Energy has received more than 20 LNG export applications from new liquefaction facilities and existing LNG importers looking to repurpose their terminals as export centers. If all were approved, roughly 38 billion cubic feet per day of LNG, or approximately half of current US production, would be available for export.^{xiv} The first LNG exports are set to begin in 2015.



Shale development and production has been slow to develop abroad, and significant barriers to entry—including infrastructure, geographic and governmental hurdles—should make

LNG and other energy-related exports will help boost terms of trade for the US economy. We project petroleum net imports will near zero by 2020. (Petroleum net imports consist of oil, natural gas and refined products.)

America's LNG exports a durable comparative advantage. US companies are almost certain to target Europe as a top market for LNG exports. Europe is a more cost-effective destination than Asia (with



shipping costs roughly \$1.25 per MMBtu cheaper^{xvii}), and recent strife in the Ukraine exposed a natural incentive to diversify European energy imports away from Russia. Some EU countries, including Belarus, Czech Republic, Slovakia, Ukraine and Poland, source more than 50% of their natural gas from Russia. The supply represents anywhere from 8% to 64% of total energy consumption, depending on the given country's energy mix.^{xviii}

DECLINE IN SHALE PRODUCTIVITY AMONG KEY RISKS

The prospects remain bright for the US petroleum industry, and we believe shale development will sustain growth in MLPs, petrochemicals, manufacturing and LNG over the next several decades. But there are risks to the growth scenarios we have outlined, including:

- **Feedstock:** The most obvious threat is a decline in shale productivity, which would drain the cost-advantaged oil and natural gas feedstock upon which so many mid- and downstream industries depend. New wells commonly experience 70% to 80% drops in output, so the industry must continue to drill aggressively to keep production flat. Production can also suffer as companies expand away from the core of the plays and develop multiple intervals within the same play. Additionally, potential environmental regulations, such as controls on waste water disposal, chemical use, land use, and air emissions, will likely increase the costs of shale production.
- **Tax Reform:** MLPs were designed to incentivize US infrastructure investment by granting favored tax status to companies that used specific assets (like pipelines and refining equipment) to generate stable cash flows and returns. Over time, some companies have pushed the envelope on allowable MLP assets, which could draw increased political scrutiny and eventually threaten the partnerships' valued tax status. Eliminating MLP tax advantages is also on the table as part of corporate tax reform. Ultimately, we believe demand from MLP's retail investor base and the government's desire to support infrastructure will likely protect the partnerships' tax treatment; however, any overhaul that subjects MLPs to the 35% corporate tax rate would lower the economics of the MLP structure and hamper the industry growth it promotes. The elimination of the intangible drilling cost write off, which allows exploration and production (E&P) companies to expense the entire cost of a well in the first year, is another risk of corporate tax reform. Without deferred tax status, E&P cash flows would suffer, and spending on shale development would decline.
- **Interest Rate Environment:** If rates were to rise markedly, MLP units would come under considerable pressure, potentially impacting the rate at which infrastructure growth occurs in the US.
- **Labor Unit Cost Inflation:** The US may not have enough skilled labor to build the dozens of massive LNG terminals, chemical and refining plants, and rail facilities slated for development on the Gulf Coast. Labor shortages and significant wage inflation would seriously impair the economics of many proposed projects as cost overruns could lower returns below companies' targeted internal rates of return. The energy sector is already grappling with a "generation gap" in petrochemical engineers and soaring wages thanks to low oil prices during the 1980s and 1990s. This gap resulted from the relatively few students who entered the industry over the past two decades because the low oil prices eroded job possibilities.

ENERGY REVOLUTION SHOULD BOOST US EMPLOYMENT, PRODUCTIVITY IN LONGER TERM

We believe the US is entering the second leg of its energy revolution, and we remain positive on developments in the energy sector and downstream industries. As investment spending fans out from the energy sector into chemicals and manufacturing, we expect the US economy to reap broader-based employment and productivity gains. While there are risks to this outlook, we believe they may be manageable.

Longer term, we see the US's reliance on foreign oil and dependence on resources from unstable governments drawing to a close. Our view that the US petroleum trade balance might fall close to zero in the next decade could have tremendous positive implications for the US dollar.



ENDNOTES

- ⁱ China passed the US to become the world's largest energy consumer in 2009, according to the International Energy Agency.
- ⁱⁱ Bloomberg, NYMEX Natural Gas Futures Prices as of August 10, 2014.
- ⁱⁱⁱ BLS; May 2014 unemployment rate, last modified June 20, 2014.
- ^{iv} IHS Global Insights, "The Economic and Employment Contributions of Unconventional Gas Development in State Economies," June 2012; and Loomis Sayles Research.
- ^v McGrail, "Burr MLP & Pipeline," April 2014 presentation, slide 12. Data sourced from company filings and presentations.
- ^{vi} Within the energy sector, MLPs are publicly traded partnerships that must derive at least 90% of their income from the exploration, development, mining or production, processing, refining, transportation or marketing of any mineral or natural resource. Their corporate earnings are not taxed, but distributions to unit holders are taxed at individual rates.
- ^{vii} ICIS estimates, as of January 2014.
- ^{viii} American Chemistry Council.
- ^{ix} Citi Research, "The New American Gas Century," p. 6.
- ^x Haver Analytics, Ministry of Labor and Social Security, data through December 31, 2012.
- ^{xi} US Federal Reserve, "Industrial Production and Capacity Utilization - G.17," June 16, 2014.
- ^{xii} American Chemical Council.
- ^{xiii} US Energy Information Administration (EIA).
- ^{xiv} Cheniere Energy, "US DOE Applications for LNG Exports," May 2014 presentation, slide 15. Cheniere is a Houston-based energy company primarily engaged in LNG-related businesses.
- ^{xv} Deutsche Bank & Bloomberg.
- ^{xvi} Loomis Sayles and HSBC. BP statistical view of world energy 2013.

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