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THE ROLE OF US SHALE IN EUROPEAN ENERGY SECURITY AND TRADE

In October 2015, the Center on Global Energy Policy at Columbia University convened a group of experts from academia, government, industry, nongovernmental organizations and research institutions for a roundtable in London to discuss the implications of the US shale oil and natural gas boom on European energy security and trade. The following document summarizes the event, which was held under Chatham House Rule, supplemented with information from a discussion document prepared for attendees.

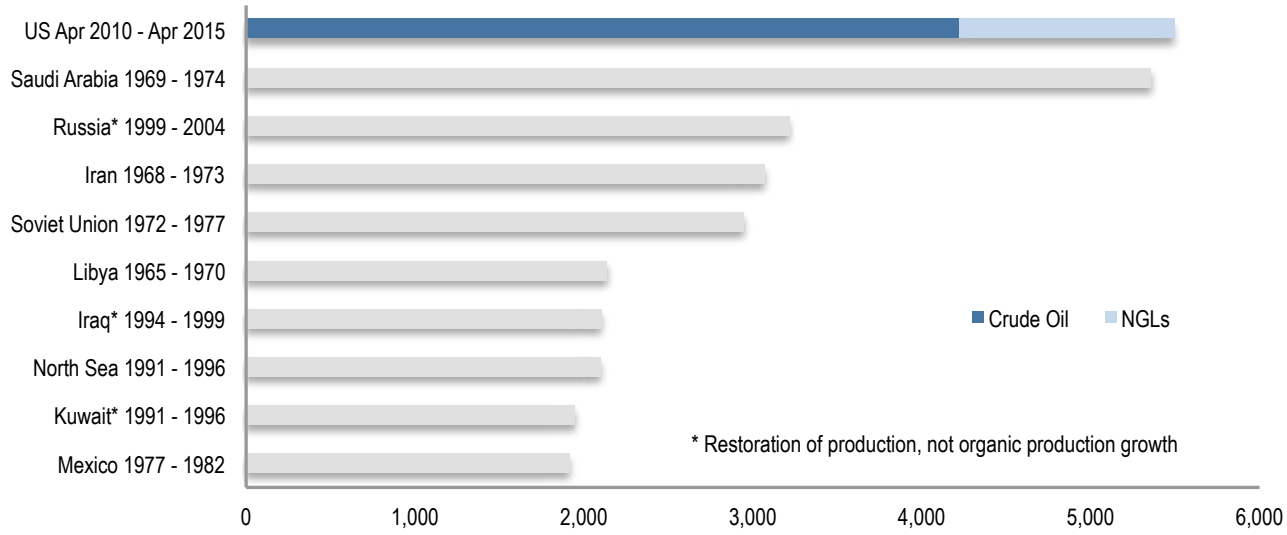
Europe's energy supply and security situation has changed dramatically in recent years. While a host of new issues have sprung up to challenge global energy markets—including the Arab Spring, the Russia-Ukraine crisis, the Fukushima accident in Japan, the rise of Islamist terrorism, and changes in the consumption patterns of emerging economies like China—Europe has also faced its own energy issues. The continent's strong dependence on Russian energy supplies, declining domestic fossil fuel production, and the move to address greenhouse gas emissions are just a few of the problems facing the energy policy leaders of European nations.

The surge in US natural gas and oil production brought about by the exploitation of shale resources was concurrent with the emergence of many of these issues and has caused major ructions in both gas and oil markets. Its scope cannot be overstated. From 2010 to 2015, the United States experienced the largest five-year ramp-up in oil production of any country in history (Figure 1). From 2005 to 2015, US natural gas production increased more than 50 percent (Figure 2). Both of these production booms were made possible by technological advancements combining horizontal drilling and hydraulic fracturing that allowed oil and gas to be extracted economically from shale and other tight geologic formations.

The broad impact of the changes in the US energy sector for worldwide energy trade and security has been widely discussed. The specific impact on Europe thus far has not attracted all the attention it warrants, nor have the implications of the start-up of US exports of natural gas and crude oil in 2016 for the region. As part of its efforts to promote a realistic and sober assessment of what the changes in the United States mean for Europe, the Center on Global Energy Policy at Columbia University held a roundtable under the Chatham House Rule in October 2015 with energy experts from industry, government, research institutions, and nongovernmental organizations.

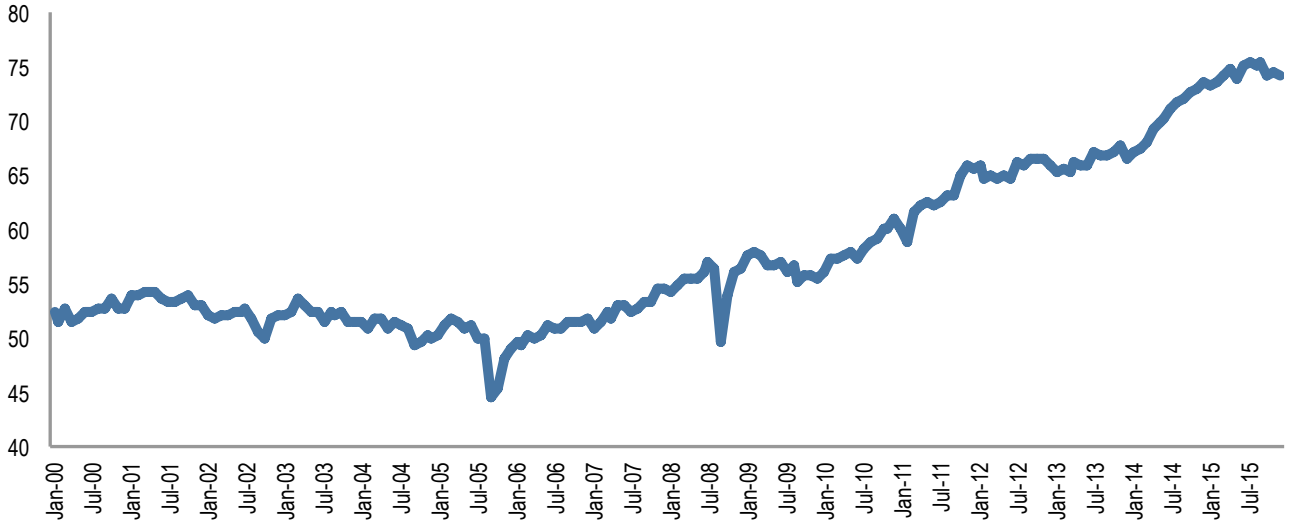
Following is a summary of the roundtable, supported with highlights from a discussion document prepared in advance for participants. This report begins with background on the developments in US unconventional oil and natural gas production over the past decade and what they have meant for Europe, then discusses the outlook for Europe as the United States looks to begin exports of LNG (and possibly oil) in 2016, and concludes with a discussion of the low oil price environment that was brought about in significant part by the shale boom.

Figure 1: Largest Build-Outs in Oil Production over a Five-Year Period
(Thousands of barrels per day)



Source: BP Statistical Review of World Energy 2015, EIA.

Figure 2: US Dry Natural Gas Production
(Billion cubic feet per day)



Source: EIA Short-Term Energy Outlook.

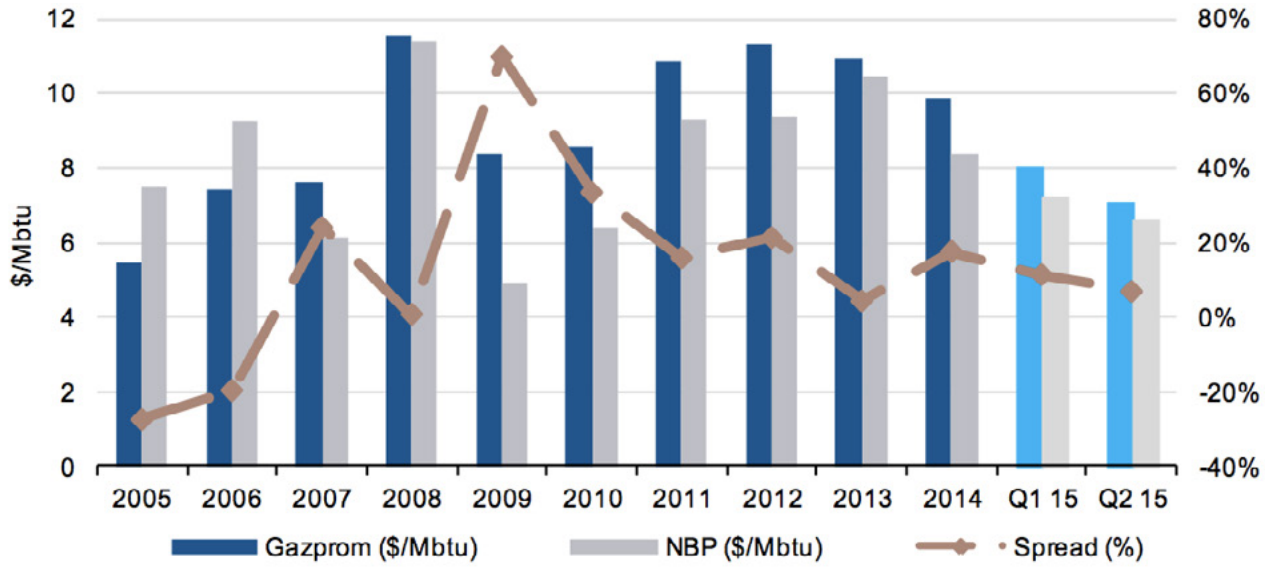
BACKGROUND

The steep rise in US oil and natural gas production has dramatically altered global trading patterns. Just a decade ago, forecasters expected US imports of both fuels to continue to swell due to unrelenting demand and limited domestic production potential. The natural gas resources unlocked from unconventional resources over the past ten years, and more recently in oil, have completely reversed that view. The outlook is so changed that in 2016 the United States will begin to export LNG from the lower forty-eight states for the first time.[1] The swell of oil production reached a level that prompted Congress at the end of 2015 to eliminate restrictions on oil exports put in place in the 1970s that sought to bolster the security of US crude supplies and the efficacy of long-abolished domestic price controls. [2]

For Europe, the growth in US oil and natural gas output has had a mixed impact. Disputes between Russia and Ukraine, which led to a shutdown of natural gas supplies to Europe in 2006 and 2009, have highlighted the vulnerability of Europe's energy security, created by the continent's strong dependence on Moscow for energy supplies. This reliance not only complicated the European Union's ability to respond to events such as Russia's most recent adventurism in Ukraine, but also leaves Europe strongly beholden to Russian state gas company Gazprom and its pricing policies.

Nevertheless, Europe has found some important benefits from rising US natural gas supplies, which have displaced waves of LNG that had been intended for the US market. Back in 2005, the US EIA had projected that US LNG imports in 2015 would reach 12 billion cubic feet per day (bcf/d),[3] more than the 10 bcf/d currently exported by Qatar, the world's top producer. Instead, those LNG volumes were redirected, mainly to the European market. This helped drive down spot gas prices in the continent (Figure 3) and brought many major gas exporters—including Russia, Norway, and Algeria—to the bargaining table with European consumers. Producers were forced to offer substantial price discounts and more flexible contract terms to their European customers.

Figure 3: Gazprom Realized Gas Price in Europe versus NBP Month Ahead
($ per mmBtu)



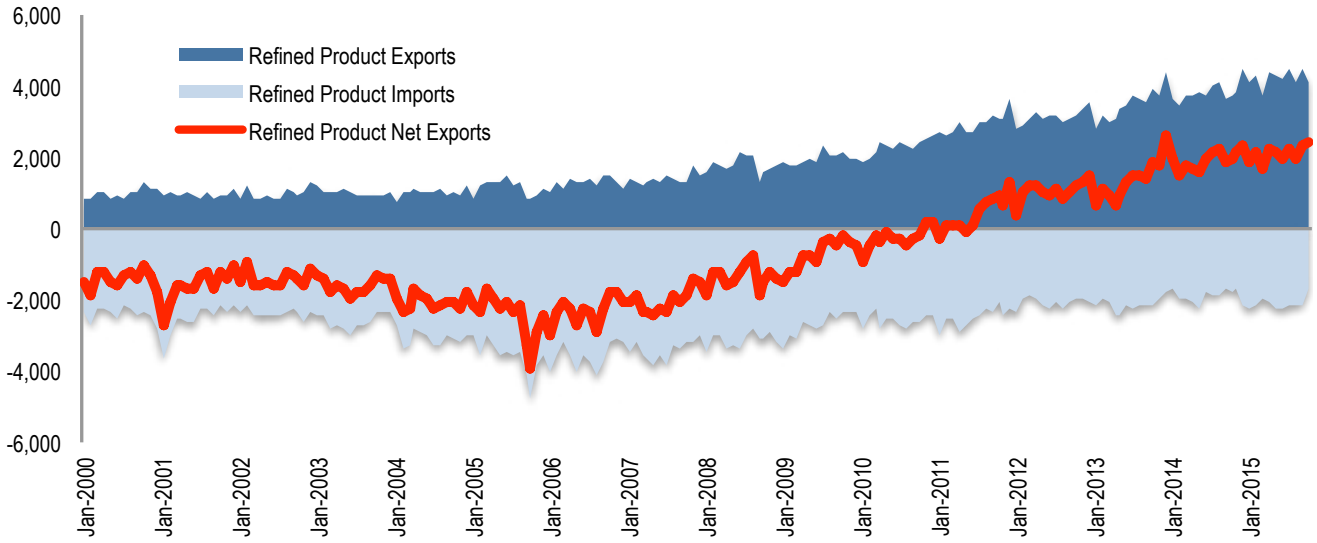
Source: Thierry Bros, Société Générale.

Whereas 80 percent of European gas sales were indexed to oil a decade ago,[4] by 2014 contract renegotiations increased the volume of gas sales tied to hub prices, leaving about 30 percent indexed to oil.[5] Hub pricing allows gas prices to more accurately reflect the dynamics of the global gas market, whereas oil-indexed prices tie them to dynamics of oil markets. A 2014 study by the Center on Global Energy Policy, "American Gas to the Rescue? The Impact of US LNG Exports on European Security and Russian Foreign Policy," found that in nearly twenty contract negotiations with Russia's primary European customers, substantial price discounts were offered either through linking 15 percent of contracted volumes to hub prices or incorporating discounts of 7 percent to 10 percent into existing oil-linked contracts. The study calculated the annual effect of these discounts to amount to $5 billion in Gazprom's revenue loss, based on 2013 delivery data.[6]

Meanwhile, the development of US shale oil resources led to a surge in production of primarily high-quality light sweet crude that caused major shifts in global oil markets. Global oil prices have plunged from $115 a barrel in June 2014 to below $30 a barrel by January 2016. Light sweet crude supplies that had been destined for the shores of the world's biggest consumer were diverted to other markets. Similar-quality oil from the North Sea and West African crude was forced to compete for market share in Europe and Asia.

The availability of cheap domestic natural gas and oil feedstock sparked an industrial, refining, and petrochemical renaissance in the United States and squeezed margins for Europe's ailing refining sector. US gasoline imports from Europe, which had been a constant feature of Atlantic Basin energy trade for decades, declined.[7] As US refiners ratcheted up runs, overseas fuel shipments shot up. The United States became the world's biggest refined product exporter (Figure 4), giving European companies new competition in Latin American and African markets that had long been reliable outlets for excess output of gasoline and residual fuel oil.

Figure 4: US Refined Product Imports and Exports
(Thousands of barrels per day)



Source: EIA.

US EXPORTS AND EUROPE'S ENERGY FUTURE

The impact of the US shale boom on Europe will deepen in 2016 with the start-up of US LNG exports and, over time, the potential for increased exports of US crude oil.

LNG

First shipments of US LNG from the lower forty-eight states are expected to sail from Cheniere's Sabine Pass terminal in early 2016,[8] with the bulk of supply expected to come online in 2017–2018. Participants in the CGEP roundtable agreed that the prospects for US LNG exports are robust: about 65 million tons of liquefaction capacity is under construction, and given the current price levels and the contract structures, it seems likely that most of the gas will be lifted from US export terminals, at least as long as the variable cost of liquefaction fuel plus transport is lower than the prevailing market price in overseas markets.

When many of these projects were initiated, it was expected that the LNG would go to the Asian market on the assumption of high oil-linked LNG prices in the Pacific Rim. However, in the current price environment, participants said that the most likely destination for US LNG will be Europe. Industry experts estimated that the arbitrage window for already sanctioned US LNG export terminal projects is open at European price levels of around $6 to $6.5 per million British thermal unit (mmBtu). However, European spot prices have since fallen further and dropped below $5 per mmBtu by January 2016. At current European spot gas price levels, the economics of US LNG exports is considerably more challenging than it seemed only a few months ago.

The pricing terms under which US LNG will sell offer some advantages to European buyers relative to those offered under traditional Russian gas contracts. The short-term nature and freedom of destination built into US LNG contracts can help Europe diversify its supply mix and provide an additional buffer when disruptions occur. While destination clauses are not necessarily embedded in Russian gas contracts, the prevalence of long-term gas transportation contracts is a limiting factor, which results in losses in market efficiency and the accrual of additional costs and delays for European gas markets. While the prices offered from oil-linked contracts may potentially fall below current hub-indexed prices in the short term, it is not predicted to create a lasting threat to the rise of gas-on-gas contracting.

Following Russia's aggression in Ukraine, there has been some public discussion about the ability of US LNG shipments to counter Moscow's energy leverage over Europe. Attendees at the CGEP event, however, said the start-up of US exports is unlikely to lower Europe's dependence on Russian gas. Even if more LNG is imported to Europe in the coming years, it is more likely to fill the gap between stagnant demand and falling production, rather than displace Russian volumes from the supply mix. Russia's primary objective appears to be to maintain market share in Europe. Russia has substantial idle producing capacity in the legacy Western Siberian producing region, where practically all costs are sunk. Hence, Russia can easily increase production levels without undertaking any new investments if it decides to "price out" US LNG from the European market.

It was also noted that a substantial portion of Russia's current European gas market share is "locked in" in long-term gas supply contracts, which tend to be enshrined in intergovernmental agreements. These are nearly impossible to terminate legally, although they can be periodically renegotiated. The contracted volumes are typically fixed, and the minimum contractual obligations have actually exceeded demand from Gazprom's European consumers in the past few years. The unwanted volumes were reexported or resold on the spot market. In short, only a small portion of European gas demand is contestable, and US LNG has relatively little room to compete with Russian gas until 2025, when Gazprom's long-term gas contracts start to expire.

US LNG can nonetheless give European consumers more leverage to renegotiate some of those terms of oil-linked, take-or-pay contracts with Russia and other suppliers. The buildup of LNG supplies from the United States and other producers, such as Australia, in the second half of the decade is expected to shift the market into oversupply. Some participants at the CGEP roundtable said the market may now be at a turning point for pricing as countries seek to benefit from the lower prices and greater flexibility of a looser gas market. Some expect that oil-indexation could give way

completely to hub-indexation by the end of the decade.

Indeed, some participants noted that European consumers may benefit most if they use US LNG as a negotiating tool. Lithuania, for example, had already leveraged the optionality created by its newly constructed LNG import terminal to secure better terms with Russia's Gazprom before the facility had even been completed. While Lithuania still takes Russian gas (at a lower cost) as its default supply source, the LNG terminal exists as an alternative. One participant suggested there may be another lesson for European policymakers: if LNG is used as an insurance policy, then someone has to pay for the cost of insurance, which in this case is the underutilized LNG import infrastructure. The Lithuanian experience shows that the cost of such energy security projects have to be socialized, by including the cost of the infrastructure in the regulated asset base, for example.

In addition, participants noted that in order to reap the maximum benefits of growing global LNG supplies, EU regulatory activity is needed to enhance the region's import and distribution capabilities. Russia's gas cutoffs to Ukraine in 2006 and 2009 exposed the degree of Europe's vulnerability to supply disruption, prompting gas infrastructure investments of €1.3 billion as part of the European Energy Program for Recovery between 2009 and 2012.[9] However, the Russia-Ukraine crisis that began in 2014 has served as another painful reminder of the need for even greater market integration.

A recent 2015 EU analysis finds that while existing infrastructure is capable of meeting all import projections through 2040, internal infrastructure bottlenecks continue to be a source of significant energy market fragmentation.[10] Some attendees at the CGEP roundtable said EU policymakers should expand reverse flow capacities in key interconnection points, implement clear and transparent market-based rules for interconnection capacity allocation, and facilitate regasification infrastructure development in southeast Europe, among other measures—consistent with measures called for in the EU Energy Union package.

Europe has twenty-three large-scale and four small-scale operational LNG import terminals.[11] The majority are located in Western Europe, notably Spain, Portugal, France, and the United Kingdom.[12] Even though European LNG import terminals were only running at 22 percent capacity utilization in 2014,[13] existing infrastructure bottlenecks mean that markets across central and southeast Europe remain vulnerable to supply disruptions.

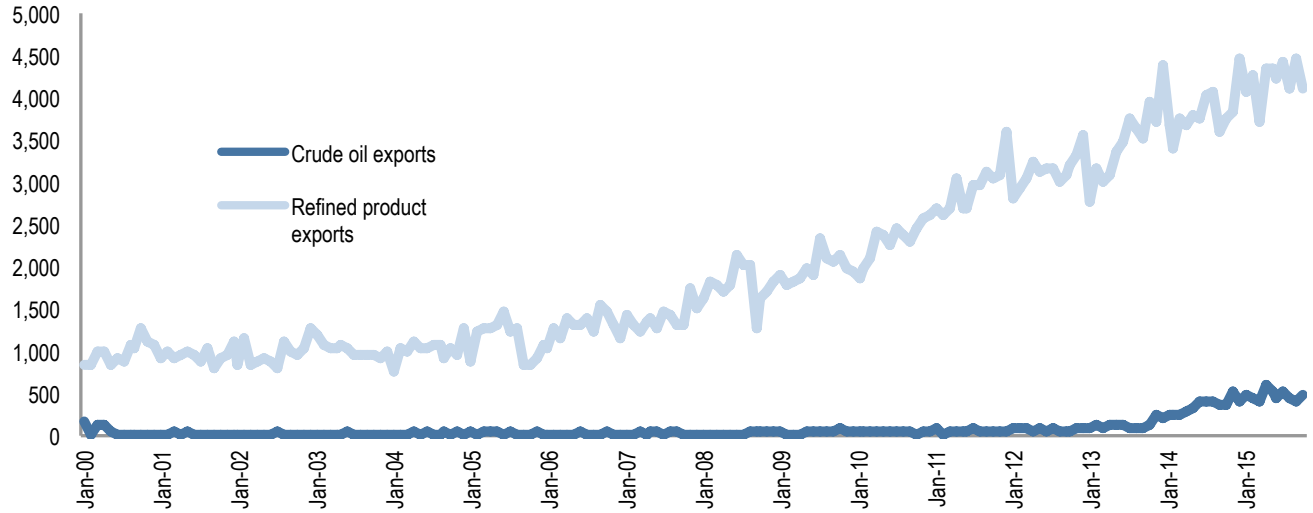
The lack of commercial viability and the below-average rates of return are challenging the development of key energy security-related infrastructure projects, however. The Projects of Common Interests is one policy tool designed to help finance projects with significant energy security benefits but low returns. However, with only €650 million made available in 2015 for European electricity and gas transmission projects,[14] many experts argue this sum is too small to make any sizable impact. The optimization of existing capacity could help Europe address the fragmentation of its infrastructure networks in a time- and cost-efficient way.

Roundtable participants noted that the lower gas prices derived from US LNG shipments could also help the European Union reach its emissions targets. Cheap gas can induce significant coal-to-gas switching in the European power generation sector. This has already begun to occur in Britain, where carbon prices are higher, thanks to the UK carbon price floor. In continental Europe, gas prices have to fall more to allow gas-fired generators to begin to squeeze coal out of the power mix. At the same time, questions were raised about the extent to which cheaper gas would undercut renewable and nuclear energy, which are zero-carbon sources.

OIL

In December 2015, subsequent to the CGEP roundtable conversation in London, the US Congress lifted restrictions on exporting US crude oil that had been in place for forty years.[15] Crude oil export constraints were originally adopted in the 1970s in response to concerns about oil scarcity and to prevent oil producers from getting around domestic price controls by selling oil into the global market for a higher price. Price controls were repealed in 1981, but the export restrictions remained.[16] Over the years, these restrictions were eased—for example, allowing unrestricted exports of refined products, shipments to Canada, or exports of lightly processed condensate. The United States currently exports roughly 500,000 barrels per day of crude oil, and more than 4 million barrels per day of refined product (Figure 5).

Figure 5: US Crude Oil and Refined Product Exports
(Thousands of barrels per day)



Source: EIA.

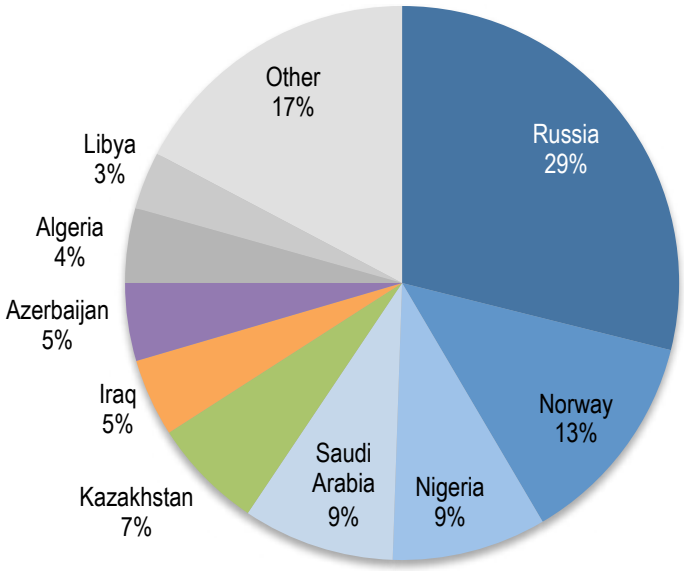
How much oil the United States exports now that all restrictions have been lifted will be determined by factors such as US production levels, the flexibility of existing US refineries, and oil price levels and spreads between different crudes. In the current oil price environment, where US crude is trading close to international prices, participants expect that little additional oil will leave US shores for foreign markets.

However, as discussed in a recent CGEP paper, European policymakers have been interested in including a chapter on energy trade in the Transatlantic Trade and Investment Partnership. Concerns have been expressed about the stability of Europe's oil suppliers, including Russia, as well as some of the key producers in the Middle East and North Africa. US crude exports might enhance Europe's sourcing optionality in the event of a major supply emergency, and US light sweet crude would be a suitable feedstock for a large number of European refineries.

Europe is highly dependent on oil imports (amounting to 88 percent of requirements in 2012), and this dependence is only expected to increase through 2030.[17] As with gas, Russia is a key supplier to Europe, providing about a third of the region's oil imports (Figure 6), with 30 percent of those imports arriving through the Druzhba pipeline and 70 percent by ship.[18] Russia's favored position in the European oil import mix is expected to continue in the foreseeable future, as it is in gas.

But unlike natural gas, oil is traded in liquid global markets, and nearly 90 percent of crude oil is imported into the European Union by sea.[19] This makes it relatively easy to switch suppliers and supply routes in the event of a disruption. Several inland refineries are also connected to seaborne crude supplies via pipelines and inland waterways. Landlocked refineries in central and eastern Europe—particularly in Poland, Slovakia, Hungary, the Czech Republic, and the eastern part of Germany—are more dependent on Russian crude arriving through the Druzhba pipeline system. Most refineries along the Druzhba route have access to alternative oil import infrastructure, but the EU Commission cautioned in 2014 that some of these alternatives have insufficient capacity to wholly replace Russian crude in the event of a disruption, and called for more pipeline connections to further diversify crude import routes in the region.[20] EU member states also hold strategic crude oil and product stocks, which provide a comfortable cushion against short-term disruptions.

Figure 6: Crude Oil Imports into the European Union by Origin
Share of total crude oil imports



Source: European Commission, DG Energy.

From a refining perspective, participants at the CGEP roundtable noted that the impact of the US shale oil boom was largely negative for Europe in recent years. Lower-cost US light sweet crude gave US refiners a decisive competitive advantage vis-à-vis their European competitors at a time when much of the European refining sector was already suffering from structural challenges, including the emergence of export refineries in the Middle East and Asia.

After a wave of refinery closures, Europe today is more dependent on refined product imports than it was a few years ago. Europe's troubles were partly caused by US refined product exports, and partly by a broader shift of global petroleum trade away from crude oil and toward refined products. The oil price collapse and the subsequent demand rebound in the otherwise declining European product market brought about some positive news for European refining in 2015. Some participants suggested that this will likely be temporary, while others noted that some factors could help European refiners on a more sustained basis. The Volkswagen scandal, some noted, may push European demand away from diesel and toward gasoline, which would be beneficial for the European refining sector as a whole. The lifting of the US crude oil export ban could also provide lasting benefits to European refiners by improving their competitive position relative to US refiners on the East Coast. US refiners in this region received a strong economic boost from the availability of low-cost US oil relative to their European competition, a benefit that could be reduced by the price rebalancing implied by unrestricted US crude exports.

LOW OIL PRICES

The current low oil price environment is one of the most profound results of the US shale oil boom thus far. The duration of the price collapse, the changes that it has caused in the market, and its impact on the future of US production were key discussion points at the CGEP roundtable.

While the shale boom had initially been made possible by years of high and stable oil prices, oil markets have undergone a dramatic downturn since the mid-2014, thanks to steep gains in US supply as well as slowing Asian demand growth and changing OPEC production policy. The price drop raises difficult questions about the outlook for oil supply, especially for US light tight oil, and the shape of oil markets in the future. As lower oil prices are one of the most significant results of the shale boom, participants at the roundtable spent considerable time discussing the outlook for US production and global markets to better understand the landscape against which European policymakers will be making energy decisions in the medium term.

Indeed, the changes in oil markets go beyond production volumes, price declines, or the sense that the world will no longer have to grapple with concerns about oil scarcity. Many now argue that a new, unprecedented oil regime is replacing the one that has been in place for at least three decades. Importantly, after years of adjusting oil production to influence crude prices, OPEC has seemingly given up its role of market stabilizer. In the face of the steep drop in oil prices, the producer group has not adopted a strategy to remove oil from the market and restore the market balance. Saudi Arabia, OPEC's top producer and the only country with significant spare oil production capacity, opted to raise output levels and increase market share instead.

Because US shale oil production can in theory be ramped up and down relatively quickly, some market watchers have suggested that the United States could step in and act as the world's new swing supplier, providing price stability by bringing new oil to the market when prices spike and idling production when they fall. Yet it has become clear that US shale oil output takes longer to respond to lower prices than OPEC spare capacity, which can respond in a matter of weeks. American shale oil production has proven to be more resilient than many expected, thanks to accelerating efficiency gains, cost deflation, and more or less unimpeded access to capital markets (at least until the first half of 2015). Participants at the CGEP roundtable noted that the most vulnerable component of US crude oil supply in a sustained low oil price environment is production from very small producers—the so-called stripper wells—that pump around 800,000 barrels per day in total. When these wells shut down—a process already underway due to low prices—they typically never come back again.

Industry participants also noted the significant differences among the major shale plays, suggesting that their supply dynamics are less homogenous than commonly believed. They observed that oil output from the Permian Basin, one of the major US unconventional plays, is still increasing while Eagle Ford production has seen sharp month-on-month declines. In short, if US shale production is not as flexible as forecast, and without OPEC acting to balance the market, both producers and consumer nations should prepare for higher price volatility.

Some participants cautioned that high oil prices might return in a few years' time. Experience shows that basing energy policies solely on prevailing market sentiment is unwise. Only two years ago, the prevailing market view was that oil prices over $100 a barrel might be a more or less permanent fixture. Today's narrative of a "never-ending" glut and expectations of "low oil prices forever" appear similarly misguided, according to attendees.[21]

Comparisons were drawn between the current period of low oil prices and the drop that occurred in 1985–1986. Critically, they noted that in 1986 spare production capacity represented more than 20 percent of global demand, a healthy buffer for countering potential supply shortfalls. However, in the current market, spare capacity only amounts to about 1.5 to 2.0 percent of global demand, held by Saudi Arabia and other key Arab OPEC nations in the Gulf. Another 1.5 to 2.0 percent could be drawn from global commercial storage.[22]

In total, this capacity and storage buffer amounts to less than 4 percent of global demand. Participants noted that this was less that the 5 percent threshold many experts would consider a safe buffer. In short, despite the current oversupply, the market faces greater upside risk now than it did thirty years ago.

In discussing the importance of oil inventories, participants noted the debate in the United States about whether Washington should sell down the robust strategic

petroleum reserve (SPR) to raise money. Attendees noted that while there were some points worth discussing about the size and location of the US reserve, given the heightened importance of the government oil inventories held by consuming countries as a global buffer, it would be unwise for the United States to use its stockpiles as a "piggy bank."[23] Subsequent to the roundtable, the US Congress indeed sold roughly 160 million barrels of the US SPR to pay for highways and modernization of the SPR, and to close other budget holes.

Attention was also focused on how low oil prices may impact the companies that brought about the US shale revolution and the repercussions for future supplies. The US independent oil and gas sector that formed the backbone of the boom consists of 400 to 500 producers. Industry participants agreed that some consolidation in the sector will likely take place over the next five years. Capital requirements are vast in upstream oil and gas, which makes it difficult for small players to sustain drilling operations, especially in today's challenging market environment. Equity markets, which seemed to be eager to invest in US independents in the first half of 2015 despite the drop in oil prices, dried up by the second half of the year.

Reserve-based lending limits were revised down in October, tightening credit conditions for many independents. Further downward revisions are expected in the spring of 2016, which under current market conditions could set the stage for a wave of bankruptcies and consolidation in the independent oil and gas space. Majors and large-cap independents are well positioned to acquire a bigger footprint in US shale, but some participants noted that the majors historically have not been very successful in this space, as their organizational culture is geared toward large, technologically complex megaprojects.

US natural gas in the low-price environment

Lower oil prices impact US shale gas production in conflicting ways. About a quarter of American dry-gas production is currently associated with oil production,[24] mainly from the most prolific US shale plays. To the extent lower oil prices slow down oil production in the United States, associated gas production from oil wells can be expected to decrease as well. On the other hand, low oil prices have resulted in a sharp slowdown in oil-directed drilling activity and a substantial reduction of oilfield service costs across the North American oil and gas sector. This substantial service cost deflation can contribute positively to natural gas production growth in the United States by lowering the entire oil and gas cost structure and improving the economics of both associated and nonassociated gas production. The net effect of the oil price fall on medium-term natural gas production in the United States remains to be seen. As of the end of 2015, US natural gas production appears to have flatlined, but there are no signs of a looming collapse in response to lower oil prices. The EIA's current short-term energy outlook expects US dry-gas production to stagnate in the first half of 2016 but start growing again thereafter, thanks to increasing industrial demand and the ramp-up of US LNG exports.

Participants noted that the oil price collapse and the subsequent narrowing of the arbitrage gap between Henry Hub prices and spot natural gas prices in Europe and Asia have substantially reduced the appetite for new LNG offtake agreements. Some participants said that in the years preceding the oil price decline, the five US LNG export terminals currently under construction had signed long-term offtake agreements with as many as twenty-one buyers. Other projects that have not yet reached final investment decision had signed up several more potential offtakers. After the price crash, only one firm offtake contract was signed (Energias de Portugal for less than one million tons of capacity at the third train of Cheniere Energy's Corpus Christi terminal). Given the dearth of new buyers and the uncertain gas price outlook, some roundtable participants questioned whether new US LNG export terminals would reach final investment decision and start construction in the near future. Other experts anticipated global natural gas demand post-2020 leading to a tight market absent additional investments between now and 2020.

Attendees also said that the cost of additional liquefaction trains at US brownfield sites has been relatively low and fairly stable, at around $600 to $800 per ton of annual export capacity. The experience of project developers with new US LNG export terminals indicates that this favorable cost structure relative to overseas LNG projects is sustainable in the longer term. According to the estimate of one industry participant, new trains at existing export terminals can be profitable as long as the price differential between Henry Hub and European gas prices is greater than $3 per mmBtu.

CONCLUSION

Rising production of US oil and natural gas from unconventional shale deposits has dramatically altered the outlook for global energy markets. After slashing US import requirements and freeing up supply elsewhere, the United States is now poised to begin exporting LNG from the lower forty-eight states for the first time, and oil exports may increase as well following the lifting of the restrictions that date back forty years.

For Europe, which has struggled with declining domestic production and a high dependence on Russian energy exports, the rise of US gas and oil production has had many benefits, although some challenges as well. Increased availabilities of LNG supply, in part due to the decline in US import requirements, have lowered prices and enabled European buyers to renegotiate contracts to achieve more favorable terms. That leverage is expected to increase with the start-up of US LNG shipments. However, Russia is likely to remain the dominant supplier, given its substantial idle production capacity in the Western Siberian region and its desire to maintain market share in Europe. By investing in more infrastructure to allow for greater integration of the European market and higher penetration of LNG, Europe could increase the benefits it sees from rising LNG supplies.

Higher US oil production and discounted US crude prices meanwhile, benefited US refiners at the expense, in part, of their European counterparts. As US refiners ramped up throughput, European plants faced increased competition in their traditional markets in the United States, Latin America, and Africa. Ending the ban on US crude exports should benefit European refiners to the extent US refiners are less able to benefit from discounted US crude prices.

The collapse in oil prices complicates the outlook for US shale and for energy markets in general. The decision by Saudi Arabia and other key OPEC members to push up production to increase market share has left the world with little spare capacity to temper any disruptions. At the same time, the collapse is testing the elasticity of US shale oil production for the first time. While production held longer than expected, US output has been impacted by the decline in prices, and questions remain regarding how reactive US production will be to an increase in oil prices.

Ultimately, how long the low price environment lasts, what further changes it brings to oil and gas markets and to US output, and how governments react, will determine much of the medium to longer-term benefits that Europe can derive from the potential of US shale production.

NOTES

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22 For further reading on OPEC's oil market policy, see the commentary of Bob McNally, fellow at the Center on Global Energy Policy: http://energypolicy.columbia.edu/sites/default/files/energy/Commentary-%20Welcome%20Back%20to%20Boom–Bust%20Oil%20Prices.pdf.

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