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Oil and Gas Reality Check 2014

A look at the top issues facing the oil and gas sector

Contents

Foreword

Last year's edition of Reality Check put forth a new approach. Rather than simply identifying the issues that are of interest to the sector, it focused on five primary challenges and attempted to predict a direction these trends would follow. Bolder and provocative, this approach was well received. The 2014 Oil and Gas Reality Check builds upon this framework, taking an overarching view of five main topics and outlining the challenges each may present to industry participants and resource owners. While the reader may find some overlap with the topics presented in the 2013 edition of Reality Check, many of the implications and suppositions associated with this year's themes are different, as another year has brought change to the industry fundamentals underlying each. These fundamentals include macroeconomic conditions, the supply-demand balance, regulatory constructs, cost components, commodity prices, competitive behavior, and the impact of geopolitics, which is now even more pronounced, and the related use of energy as a diplomatic tool.

In terms of an overarching theme, the 2014 Oil and Gas Reality Check emphasizes expansion and contraction on a number of fronts: the waxing and waning of dominance amongst suppliers; the progression from regionalization to globalization in natural gas markets and the reverse in oil markets; the growing shares of some fuels and the declining roles of others in the global energy mix; the swelling of capital projects to "mega" proportions despite, or perhaps because of, shrinking returns; and, the opening and closing of borders in response to geopolitical concerns and shifting supply and demand conditions.

We begin with the North American energy revolution, and the US shale boom in particular, which has brought the nation closer to relative energy self-sufficiency. Wholly unthinkable just a few years ago, the ripple effects from this shift in US status from major importer to soon-to-be exporter are now reaching the Middle East, Russia and China. Some fear this growing feeling of independence will translate into greater isolationism and a reluctance to remain engaged in international affairs. However, we believe that this scenario is unlikely as new sources of supply and greater competition for demand, particularly in Asia Pacific, reshape the global geopolitical landscape and create greater, not fewer, interdependencies among nations. A simultaneous shift toward cleaner fuels in the global energy mix bodes well for natural gas, and consequently for LNG as natural gas globalizes. Here, greater supply and demand is increasing the fungibility of this commodity, putting pressure on oil indexation pricing, and forcing consideration of price-flexible and destination-divertible contract options.

Balancing the global supply and demand for both oil and gas amidst these trends will require a different approach to managing megaprojects in new frontiers. It will also result in greater relaxation of nationalistic policies, which often cut both ways, protecting existing domestic markets but limiting prospects for production growth.

The 2014 Oil and Gas Reality Check represents our team's findings supplemented by expert perspectives from our partners, clients, and industry executives. Given the report's focus upon industry fundamentals, our research and analysis encompass views from policymakers, energy market traders and analysts, and energy producers and consumers across the spectrum of size and sub-sector, both privately- and government-owned.

We would be amiss if this report ignored the current geopolitical developments related to the crisis in the Ukraine, the Baltic States and Western Europe. Although not an independent topic included in our report, there is no doubt that these developments may have global energy ramifications. Related geopolitical dynamics have been woven into at least two of our topics. Nonetheless, on a relative basis, the Ukranian situation will have less of an impact on the global energy framework than the ascent of North America into self-sufficiency and possibly into a new role as an export powerhouse.

Compiling this report is a dynamic endeavor. Even as we publish this year's report, we must begin assembling our views for the next one. For that purpose, I welcome any input and advice regarding anything we might have missed, new items that could be included, and overall comments on the industry. Please do not hesitate to reach out to any of our sector leaders named in the Contacts page – or to send me an email directly.

Many thanks to our contributors for providing their views and expertise, and I hope that you will find this report to be insightful, credible and useful.

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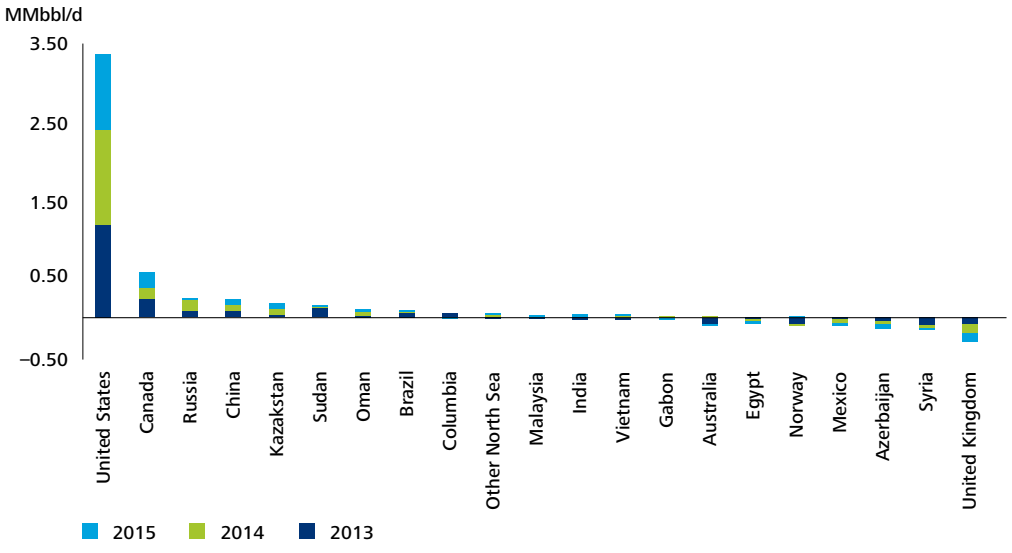
Global energy – North American revolution

Unlocking North America's shale formations has been transformational for the United States. The first effects were felt in the natural gas market as Henry Hub prices tumbled from over $13 per one million British thermal units (MMBtu) in 2008 to below $2 per MMBtu in 2012.[1] Now the US is positioned to be a net exporter of natural gas by the end of this decade according to projections from the US Energy Information Administration (EIA).[2] The transformation has been no less astonishing in the oil market. Access to tight oil, the kind found in shale formations, has increased US production from just over 5.0 million barrels per day (MMbbl/d) in 2008 to more than 7.4 MMbbl/d in 2013 – the largest five-year increase in crude production in US history.[3] With production surging and Brent trading at a premium to West Texas Intermediate (WTI), lawmakers are already discussing the possibility of overturning the ban on US exports of raw crude. This policy shift could potentially maximize the benefits to the US economy by allowing the upstream sector to export sweet crude, which trades at a premium, and allowing the downstream sector to import heavier sour barrels, which are sold at a discount. This leverages the strengths of the US refining industry whose facilities are configured to process heavier crude with higher sulfur content. This is all happening as US "peak demand" for petroleum products has receded from more than 22 MMbbl/d in 2005 to 18.9 MMbbl/d in 2013[4] and long-term demand is expected to stabilize, falling slightly to 18.6 MMbbl/d in 2040.[5]

As a result of growing domestic energy production, the US is becoming more economically independent. The petroleum-related trade deficit shrank from $386 billion in 2008 to $232 billion in 2013.[6] This drop is even more significant than it first appears since high crude oil prices, currently over $100 per barrel, have been exerting upward pressure on these figures. Rising net exports of refined products, made possible by the increased competitiveness of the US refining industry, are also pushing the balance downward. In 2008, the US was a net importer of 1.4 MMbbl/d of refined products, but by 2013, it had become a net exporter of 1.3 MMbbl/d of refined products. Natural gas, however, posted an even more dramatic shift, with the US net natural gas trade deficit shrinking from $26 billion in 2008 to just $4 billion in 2013.[7]

Growing domestic energy production has similarly been a boon to US competitiveness. Whereas offshoring has been a trend in US business for decades, re-shoring is increasingly coming into favor as companies seek to take advantage of low-cost energy and a highly trained workforce while avoiding intellectual property risks and the challenges of managing extended supply chains. The petrochemical industry, which fled the US in favor of lower-cost Middle Eastern countries years ago, is also returning. According to the American Chemistry Council, nearly 150 chemical industry projects totaling over $100 billion have been announced in the US as a result of cost-competitive domestic natural gas prices. Many of these are export-oriented projects that will further help reduce the US trade deficit.

Non-OPEC crude oil and liquid fuels production growth



Source: Short-Term Energy Outlook, March 2014

Even the US manufacturing industry, which has struggled over the last couple of decades, is poised for an energy-driven resurgence. The US steel industry, for instance, stands to benefit in two ways: first, from increased demand from the oil and gas industry for drilling equipment and tubular goods; and second, from lower operating costs. As a result, US steel producers, such as Nucor, US Steel, and Vallourec, have announced plans to construct new facilities. Across all sectors, the National Association of Manufacturers estimates the cost savings to manufacturers resulting from shale gas production at around $11 billion per year. This is making the US more competitive internationally. According to AlixPartners, manufacturing in China will be no less expensive than manufacturing in the US by 2015 – both due to lower operating costs in the US and the combination of increasing labor costs, higher energy costs, and a rising Yuan in China.[8]

Given its increased energy and economic independence, several commentators have questioned whether the US will turn inward to concentrate on domestic issues, thus detracting from its focus on foreign policy. Some believe this could mean changes in the relative balance of US national interests across China, Russia, the Middle East and Africa.

At the same time, global energy trade, which once bound importers and exporters into mutually beneficial long-term agreements, is increasingly characterized by a growing combination of short-term contracts and 'out clauses' that leave negotiation room under pre-defined circumstances. This movement away from long-term agreements is transforming international trade relationships into "marriages of convenience" that can be altered quickly or dissolved as conditions change. However, the recently announced long-term gas supply agreement between Russia and China could be an exception that proves the rule.

US – Middle East engagement

The US energy renaissance could have broad implications for the country's geopolitical affairs. If the US is able to produce more of its own energy supplies, it will be less reliant on supplies from the Middle East. As domestic production rises, the International Energy Agency forecasts that by 2035 the US will obtain just 3% of its crude supplies from the Middle East.[9] When coupled with growing neo-isolationist sentiment after 12 years of war in the region, this shift has led some to speculate that the US may soon be able to extricate itself from the region's volatile geopolitical entanglements. Middle East crude cargoes are anticipating a shift as exports are increasingly being directed eastward toward Asia rather than westward toward the US and Europe.

However, we believe that predictions of US disengagement from the Middle East are over stated. Given the fungibility of world oil markets, a disruption in Middle East oil supplies will reverberate back to the US domestic market regardless of whether the region remains a major source of crude imports or not. In addition, the region's volatility continues as the 'new normal' since the "Arab Spring". With no clear alternative to the US military for maintaining the balance of power in the region and with important allies to protect, the US will remain engaged for the foreseeable future.

US involvement in the region is also embedded in a foreign policy agenda broader than the region's ample energy supplies. The US is committed to counter-terrorism activities worldwide and, as a signatory to the Nuclear Non-Proliferation Treaty, is heavily invested in negotiations with Iran over its nuclear program. In the context of these negotiations, rising US domestic production of oil and gas has provided a new diplomatic weapon in the form of energy-related sanctions against Iran. Energy importing countries have been able to reduce Iran's crude oil exports to around 1.0 MMbbl/d, denying the regime a critical source of revenue.[10] The ability to curtail demand for Iranian oil is enabled not just by a certain amount of Saudi Arabian spare capacity to stabilize world markets, or by rapidly increasing Iraqi supply, but also by expectations that one of the world's top energy consuming nations, the US, will have its own spare capacity in the form of new production yet to come online. Oil and gas sanctions against Iran, once the number two OPEC producer, would have been wholly unthinkable just a few years ago. Rather than decreasing its interest in the region, the North American energy revolution appears to be giving the US more leverage, allowing it to intervene only in the regional conflicts of its choosing and increasing its bargaining power in diplomatic negotiations.

Russia and Europe

The North American energy revolution is complicating Russia's position in world energy markets. Where Russia once sought to unite the world's largest gas producers into an organization comparable to OPEC, it was forced to disband this notion as the US surpassed Russia as the world's largest natural gas producer in 2009.[11] Nonetheless, the European Union (EU), the Balkan countries, Norway, Switzerland, and Turkey remain reliant on Russia for 30% of their nearly 19 trillion cubic feet (Tcf) of annual natural gas needs.[12] Each country's level of dependence on Russia varies, but it generally grows as one looks from West to East. Ukraine, for instance, receives 60% of its gas from Russia – not to mention that over half of the Russian gas supplies bound for Europe flow through this nation.

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Between 2000 and 2008, Russia's economy grew at over 5% annually as oil and gas prices rose internationally.

Similarly, much of Europe is dependent upon Russia for oil, with European OECD countries importing 36% (3.05 MMbbl/d) of their crude from their eastern neighbor. This dependency becomes even higher, rising to 44% (4.3 MMbbl/d), when all liquids and refined products are considered.

Yet for Russia, Europe's supply dependence cuts both ways, with the nation relying heavily on European demand for its economic stability. Fifty-seven percent of Russia's natural gas exports are destined for Western Europe, while the rest is consumed by Turkey (19%) and Eastern Europe (24%), with a small portion exported from Sakhalin as LNG to Asia.[13,14] However, years of negotiations to open a gas pipeline to China are finally bearing fruit. This gives Russia the opportunity to expand its gas exports to the east, but not without incurring significant costs to extend its pipeline infrastructure.[15] Russia and Europe display similar interdependencies with regard to oil. European nations in the Organization for Economic Co-Operation Development (OECD) purchase 71% of Russia's crude exports and 36% of its refined-product exports.[16]

The Russian economy is without doubt overly reliant on the oil and gas industry as a source of income, with oil and gas revenues accounting for more than half (52%) of total government revenues in 2012.[17] Stated even more vividly, the oil and gas industry accounts for a third of the entire Russian economy, nearly two-thirds of its export revenues, and half of its GDP as well.[18] Between 2000 and 2008, Russia's economy grew at over 5% annually as oil and gas prices rose internationally. It then fell 7.8% in 2008 when crude prices dropped precipitously from nearly $150 per barrel to the low $30s.[19] It is clear that while Europe may need the energy, Russia needs the proceeds.

After the gas-pricing dispute with Ukraine in 2009, Europe embarked on an effort to reduce its reliance on Russia for energy supplies overall – and it succeeded to a degree. Since then, Europe displaced Russian gas with LNG and integrated its pipeline infrastructure to allow more west-to-east flows across the continent.

This shift to alternative gas supplies, gas-to-coal switching, along with the slow down in the overall European economy has already resulted in a drop in Russia's gas sales to Europe.

Shale development in North America has further blunted Russia's energy influence in Europe. Although US Liquefied Natural Gas (LNG) exports overseas have yet to begin, the availability of additional supplies not just from the US is giving European buyers greater flexibility in gas contract negotiations. Increasing natural gas production in the US has largely eliminated its own need for LNG imports, some of which was, until only four or five years ago, expected to come from Russia. With the US dropping out of the market as a significant buyer, LNG shipments are now more plentiful. Moreover, such shipments of LNG from abroad and possible future gas pipeline options from Central Asia, the Middle East or North Africa increase Europe's supply options in an attempt to reduce Russia's strategic export position. This has prompted some to speculate about what will happen if US LNG exports ramp up. LNG shipments from the US to Europe, although currently competitive in some markets, may not remain so in the future. In the countries farther east, where these supplies would be most desired to lessen Russia's grip, many countries will not be able to afford world prices, and Russia would likely continue to offer discounts to protect their position in the market. The net gain for Europe, nonetheless, is still expected to be positive. Private US companies will not sell LNG at a loss to support US foreign policy goals. LNG contracts will be commercially opportunistic; however, the increased competition would exert pricing pressure on Russia, and other gas exporters, resulting in lower overall gas prices for Europe.

Challenge to Russia's production

The North American energy revolution also complicates Russia's ability to increase its production. The era of "easy oil" has ended in Russia, as it has elsewhere. Russia's promising new frontiers now sit at the eastern edges of western Siberia or in eastern Siberia itself, or further North in the Arctic. Exploration and production in these fields will be more costly since they are more remote, geologically more complex and deeper. E&P spending in Russia is attempting to rise to the challenge, increasing from $54 billion in 2013 to nearly $60 billion in 2014.[20] But in order to remain economic, projects on the periphery require high energy prices or tax incentives already introduced by the Russian government. Growing unconventional energy production in the US is expected to have a moderating effect on international energy prices when exports are fully underway, potentially constraining development in these new frontiers.

More troublesome for Russia, a European shale revolution could potentially happen on its doorstep. Oil and gas companies, many of which helped make unconventional production a reality in North America, are just beginning to invest in European shale. The United Kingdom, Poland, Romania, and now Ukraine, have emerged as major test cases for the viability of shale resources in Europe. Although initial efforts have suffered setbacks, with no commercial discoveries to date and some major companies exiting Poland, interest remains, fueled by concerns over supply security and increased economic competition from a structurally advantaged US. These strong motivations suggest European shale efforts will likely continue despite early challenges.

Russia, however, is not letting this activity go unanswered. It is making initial experimental investments in the development of the Bazhenov shale formation in western Siberia, which contains an estimated 75 billion barrels of technically recoverable shale oil.[21] The Russian government estimates the field could produce between 1–2 MMbbl/d by 2020 if successfully developed.[22]

China

If the US is now less dependent on Middle Eastern supplies, Asia and China have grown more so. In 1992, China became a net importer of crude,[23] and by 2004, the country had become the second largest consumer of petroleum in the world at 6.4 MMbbl/d.[24] Furthermore, the EIA predicts China will become the largest importer of crude in the world sometime in 2014.[25]

Currently, China (including Hong Kong) consumes 10.5 MMbbl/d or 12% of world petroleum demand, up from 7.2 MMbbl/d in 2005,[26] and by 2040, China's import needs are estimated to grow to just under 18 MMbbl/d.[27] In 2014 alone, EIA projections suggest China will account for 25% of the growth in world oil demand despite slowing economic growth.[28]

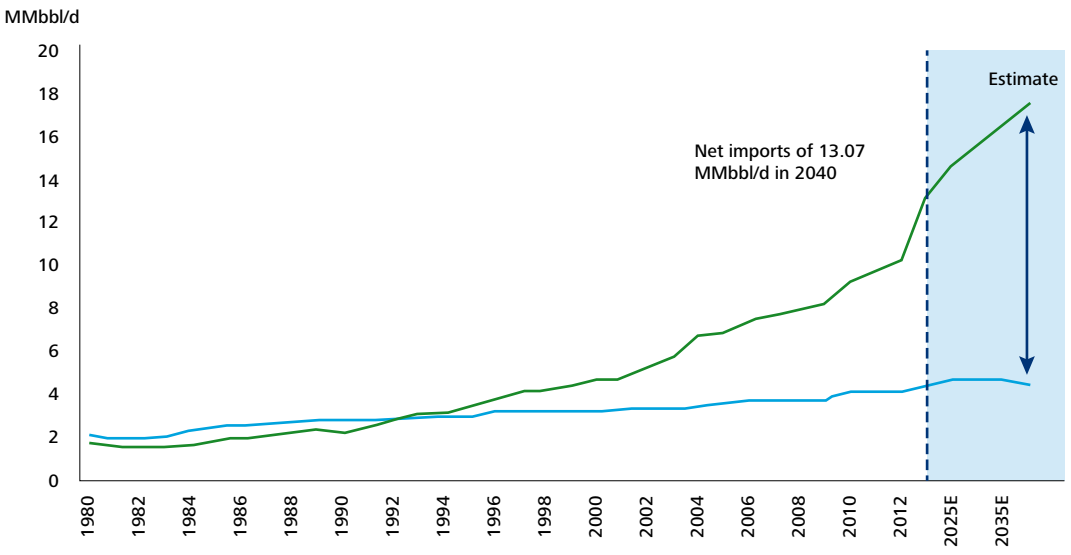
China's thirst for petroleum is affecting its economy. According to the World Bank, China's current account surplus in 2008, prior to the global financial crisis, was $348.9 billion.[29] By 2012, it had declined by a third to $231.9 billion,[30] mainly due to rising crude oil imports. For instance, China imported $135 billion in crude in 2010, just under 9% of the country's total imports of all goods and services.[31] In 2012, that figure had grown 63% to $220 billion or nearly 11% of total imports.[32]

China needs energy security in order to maintain its economic growth, which requires access to adequate, diverse, stable, and reasonably priced supplies. This, in turn, implies China has a vested interest in maintaining stability in the Middle East as well as in protecting the Strait of Malacca.

China adopted a "go out" energy policy after 1992, when the country became a net importer of oil. Sluggish domestic supply growth and poor pipeline economics left China with few options but to search out new supplies overseas, and it found them to a great extent in the Middle East. Today, China is dependent on the Middle East for more than half of its crude imports.[33]

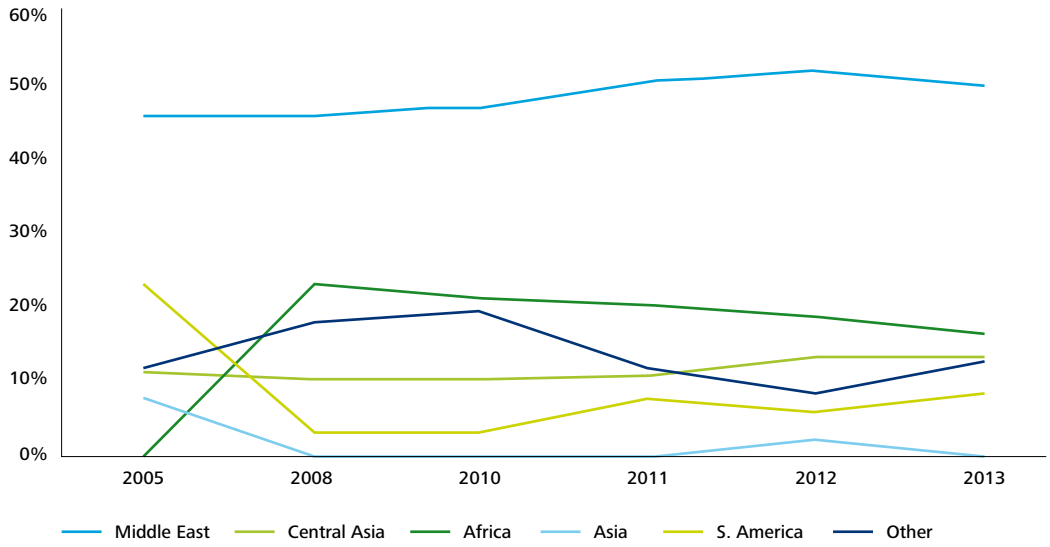
China's thirst for petroleum is affecting its economy.

Oil production vs. consumption (1980 – 2040)



Source: BP Statistical Review of World Energy, June 2013

Sources of China's crude imports by region



Source: EIA Country Analysis Brief, China; EIA International Energy Statistics

Despite efforts to diversify supplies, this dependency is unlikely to lessen anytime soon: According to the EIA, Middle East oil exports to China are projected to rise from around 2.9 MMbbl/d in 2011 to 6.7 MMbbl/d in 2035, representing 54% of China's crude imports.[34]

China's reliance on supplies from the Middle East and North Africa requires regional stability and steady trading partners. Notwithstanding the Gulf Cooperation Council's relative stability since the beginning of the Arab Spring, the region has been wracked by domestic upheavals, revolution, and civil war. All of China's major crude suppliers in the region are presently unstable except Saudi Arabia and Kuwait. It remains to be seen whether Russia's recently constructed East Siberia Ocean (ESPO) pipeline will become a new stable source of significant crude supplies to China.

If energy is the Achilles heel in China's economic miracle, will it choose to become more directly involved in the Middle East politically, economically, or even militarily? Some believe this option is unlikely since non-interference in the internal affairs of other countries is a seminal aspect of China's foreign policy.

China and Iran sanctions

Western-backed sanctions against Iran have served as a critical test of China's approach to Middle East affairs. In early 2012, the US extended its sanctions against Iran to include oil industry transactions to all Iranian financial institutions. The European Union also enacted sanctions against oil and financial transactions as well as the provision of insurance to Iran and Iranian-owned companies, which is critical for facilitating seaborne exports. Countries that did not comply with the Western-backed sanctions would be subject to secondary sanctions.

This put many oil importing countries in Asia in a difficult position, particularly China, since it was the largest consumer of Iran's oil exports (22%)[35] and it relied heavily on Iran for gasoline.

If China wanted to be more assertive in the Middle East, this would have been a good opportunity to make a first impression. China's stakes in Iran were high: Its National Oil Companies (NOCs) had made several significant investments in Iran's oil industry including a $2 billion investment in the Yadavaran oilfield by Sinopec, a $16 billion investment in the North Pars gas field by CNOOC, and a $1.75 billion investment in the North Azadegan oil field as well as a $4.7 billion investment in the South Pars Gas field by CNPC.[36] In addition, it would have been difficult for the US to impose secondary sanctions against China since it is the largest foreign holder of US government debt – not to mention the deep commercial and financial relationships between the two countries. Finally, intransigence regarding Iran-related sanctions had become commonplace. The US had tried for nearly three decades to impose strict measures against Iran usually with disappointing results even from its closest allies.

In this case, instead of defying the sanctions outright, China demurred and reduced its Iranian imports by 20% in order to obtain a US waiver. Iranian imports fell from over 550,000 barrels per day (bbl/d) in 2011 to around 450,000 bbl/d in 2012 as China replaced these volumes with imports from Russia, Iraq and others.[37] Although there have been indications that China has been backsliding on its initial reductions in Iranian crude imports,[38] its acquiescence to the new sanctions illustrates that rather than seeking a more assertive role in the region, China is deftly navigating the region's crises to ensure it maintains a continuous stream of energy supplies.

Strait of Malacca

Far from seeking deeper entanglement in Middle Eastern affairs, China has made the strategic choice quietly to reap the benefits of the US-led international system. As long as the international oil market, protected by US military power, can continue to provide China with the energy it requires, it has little motivation to take a more overt role in international energy affairs. It may, however, choose to flex its muscles in another area central to its energy security: the Strait of Malacca, which is an important seaway for ships supplying Japan and Korea as well.

Over 80% of the country's crude imports are seaborne making China's economy highly vulnerable to disruptions in maritime trade, particularly within this passage. Of the over 15 MMbbl/d of crude passing through the Strait of Malacca, more than a third is bound for China.[39] As one China security expert observed, "whoever controls the Strait of Malacca effectively grips China's strategic energy passage, and can threaten China's energy security at any time."[40] This has led some to speculate China may develop a blue-water navy to police the Strait itself. However, even a small Chinese fleet patrolling this passage would arouse concerns from regional neighbors – particularly Japan – who is also dependent on the Strait for its own energy security. A recent three-week expedition by a small flotilla of two destroyers and an amphibious landing craft in the South China Sea raised alarm in those nations with whom China has conflicting claims to sea and island territories.[41] Far from ensuring the secure and stable transit of goods through the Strait, an enhanced Chinese naval presence is more likely to be seen as a destabilizing force for regional trade flows by its neighbors. In this light, a continued US naval presence is perceived to be a better option.

Investment in North America

If self-policing of the Strait of Malacca and greater entanglement in Middle Eastern power politics aren't viable options for enhancing China's energy security, then what is?

The answer may be domestic production. China is trying to reinvigorate its own domestic oil and gas industry by emulating the US and applying new shale production technologies domestically. Since 2010, China has invested $45 billion, or more than a third of its energy-related M&A activity, in the North American energy renaissance.[42] Where Chinese investment had been almost non-existent before, it began investing heavily in North America after 2008 when the shale revolution in the US began making headlines. Not surprisingly, over 90% of this investment has been in unconventional resources, such as tight oil, shale gas and oil sands.[43] These acquisitions, equity stakes and joint ventures were largely aimed at giving Chinese companies access to technologies and "know how" that could increase their own domestic production. After all, if the US is freeing itself from dependency on Middle Eastern oil not through its diplomatic or military brilliance, but rather through technological innovation and application at home, why not China too?

It is far better for China's energy security outlook if it can boost domestic production. This option is much more appealing than becoming more deeply entangled in the murky world of energy geopolitics, resource nationalism, military aid and intervention. As Bo Qiliang, general manager, PetroChina International, stated: "Through hard work and a steadfast manner we will achieve the historic leap from the 'go out' to the 'go up' strategy."[44] Whether the success of North America's shale revolution can be reproduced internationally, particularly in areas where private property rights are limited, is open to question. However, China certainly intends to try since the alternatives do not look attractive.

As long as the international oil market, protected by US military power, can continue to provide China with the energy it requires, it has little motivation to take a more overt role in international energy affairs.

Our view

The geopolitical effect of the North American energy revolution will be felt in fewer energy-related tensions across Eurasia, as well as in a continuation of efforts by the United States' to maintain its role as keeper of the global balance of power in the face of rising Chinese and reviving Russian influence in world affairs.

Since the US will need to export less of its GDP to meet its own energy needs and with increased industrial competitiveness, the US will be wealthier overall. This will increase America's ability to maintain its overseas commitments as well as its willingness to police the sea-lanes critical to world oil markets, rather than providing a convenient means to exit these obligations.

For Russia, rising North American production will necessitate the rebalancing of its oil and gas exports between Europe and Asia to secure vital revenues for its economy in the coming years. Increased competition for a share of the European natural gas market, in particular, could require all gas importers to lower prices overall to Europe. If a shale revolution within Europe were to occur, this could further diminish longer-term gas volumes imported into the vital European energy market.

For China, the geopolitical effects are altogether positive. China can continue to take a free ride on US naval supremacy, much as the US did in the 19th century on the back of British sea power. Furthermore, concerns about supply competition with the US have been moved into the future. A Chinese shale revolution, already being planned, could shift such concerns to the far horizon.

If a shale revolution within Europe were to occur, this could further diminish longer-term gas volumes imported into the vital European energy market.

Energy supply – New sources, new geopolitics

The Organization of Petroleum Exporting Countries (OPEC) and Russia have dominated the oil and gas export environment for over half a century. Today, new suppliers are challenging their supremacy, and in the process, altering the geopolitical landscape. With hydrocarbon demand centers shifting to Asia-Pacific, the competition for control over supply is being replaced by competition for customers. This could benefit importing nations by increasing diversity of supply and potentially reducing the risk of disruptions.

OPEC's waning influence

Exports by OPEC accounted for 28% of total crude oil consumption in 2012, about the same as in the prior decade. While OPEC will continue to be a major force in the global oil markets, increasing production in the US and elsewhere will likely curb its power to influence crude oil prices by controlling marginal production.

The most significant factor in this power-shift is the impact of the US unconventional boom, with the nation poised to become a net natural gas exporter by the end of this decade and with its reliance on foreign oil imports declining.[45] According to the EIA, US crude oil output grew by 1.6 MMbbl/d to 10.4 MMbbl/d between 2010 and 2013. This led to a drop in imports from OPEC countries, mostly Nigeria and Algeria, by 1.2 MMbbl/d.[46] Increasing production from tight oil reserves may even allow the US to overtake Saudi Arabia as the world's largest liquid producer in 2014.[47] With US oil output expected to increase by at least another 1.5 MMbbl/d by 2017, the volume of crude oil purchased from OPEC countries is likely to fall further.[48]

Higher US production volumes could also decrease imports from the country's other major suppliers, Venezuela, Canada and Mexico, just as the latter two countries are expected to increase their own domestic production. According to EIA forecasts, Canadian crude oil output is expected to grow by 1.0 MMbbl/d by 2020.[49] Meanwhile, the Mexican government is hopeful that steps to liberalize its oil and gas industry will lead to a production increase of 1.5 MMbbl/d by 2025.[50]

If US appetite for their exports plateaus or wanes, these nations will need to look for alternative markets. Brazil and Kazakhstan also have the potential to expand global supplies. Production in these nations is expected to grow by 3.9 MMbbl/d and 1.7 MMbbl/d respectively by 2030.[51]

The rising tide of global oil supplies, however, won't raise all ships. In the past, OPEC has responded to oversupply conditions, and depressed prices, by lowering the overall export ceiling for its members. This time, internal discord could limit OPEC's ability to provide a unified response. In 2013, its output hovered above the agreed ceiling of 30 MMbbl/d despite the crisis in Libya, technical issues in Iraq, and sanctions on Iran – conditions that severely limited exports from these countries. This is because members with spare capacity, mainly Saudi Arabia, the United Arab Emirates and Kuwait, made up for the loss of output. This was against the intentions of countries with limited spare capacity such as Iran, which was keen on lowering overall output to ensure high prices. Dissention among OPEC members may become even more acrimonious in the future. OPEC will soon need to make a decision about which members will cut their output when production in Libya, Iran and Iraq recovers. Cutting export levels in countries affected by the Arab Spring may be an especially contentious issue since these fragile governments are being pressured to fund education, health and social security programs with oil revenues.

OPEC faces a medium-term dilemma. Expectations of supply exceeding demand could potentially lead to lower global oil prices, creating budgetary difficulties for exporting countries and posing challenges to the industry, especially for projects in high-cost environments. However, OPEC's typical response of lowering the production ceiling may equally create deleterious effects, such as generating less revenue for some members, further lowering OPEC's percentage of global crude oil, and subsequently reducing the Organization's influence on the global markets.

Fight for customers in Europe

Russia, the other leading global oil and gas exporter, could also see its dominance challenged in its main gas market, Europe. Driven largely by environmental regulations, European demand for natural gas is expected to grow by 17% by 2035, according to the BP Energy Outlook.[52] However, this does not necessarily translate into more demand for Russian imports.

Asia Pacific is a hot bed of demand growth. Between 2012 and 2035, 72% of the world's demand growth for liquids is expected to come from Asia Pacific.

Russia may face significant competition in the European gas market. Norway overtook Russia as Europe's main supplier in 2012 due to its more competitive, hub-based spot prices.[53] Supplies from Middle Eastern countries could also pose a future threat to Russia's supply dominance in Europe. In 2012, Algeria, Iran, Libya, Egypt and Nigeria combined sold 75 billion cubic metres (bcm) of natural gas via pipelines and as LNG, compared to Russian supply of 130 bcm.[54] In addition, Qatar, which was set to be a major supplier to the US a few years ago, sold close to 30 bcm of LNG in Europe in 2012. Of note, more than half of this volume was shipped to countries in Western Europe where Russia also sells gas through pipelines. The volume of Qatari LNG offered to Europe could also increase as a number of LNG projects come online in the second half of the decade, increasing competition in the Asia Pacific market and making more shipments available for Europe.

At the same time, several European countries are keen to loosen Russia's grip on their energy supplies. Both Finland and Estonia are planning to build LNG re-gasification plants to reduce Russian imports.[55] Poland is prepared to pay significantly more for Qatari LNG for the same reason.[56] Coal displaced by the US shale gas boom could also lessen Europe's appetite for Russian gas. The long-term outlook for Russian supplies in the European market could also be affected by the crisis in Ukraine, with some calling on the US government to speed up the approval process for LNG export applications as a mitigating measure – although this would only impact Europe over the longer-term.

To offset slower demand growth and increased competition in Europe, Russia has turned to Asia Pacific, and china in particular, targeting new markets there through piped gas and LNG. Russia, however, will not be alone in its quest.

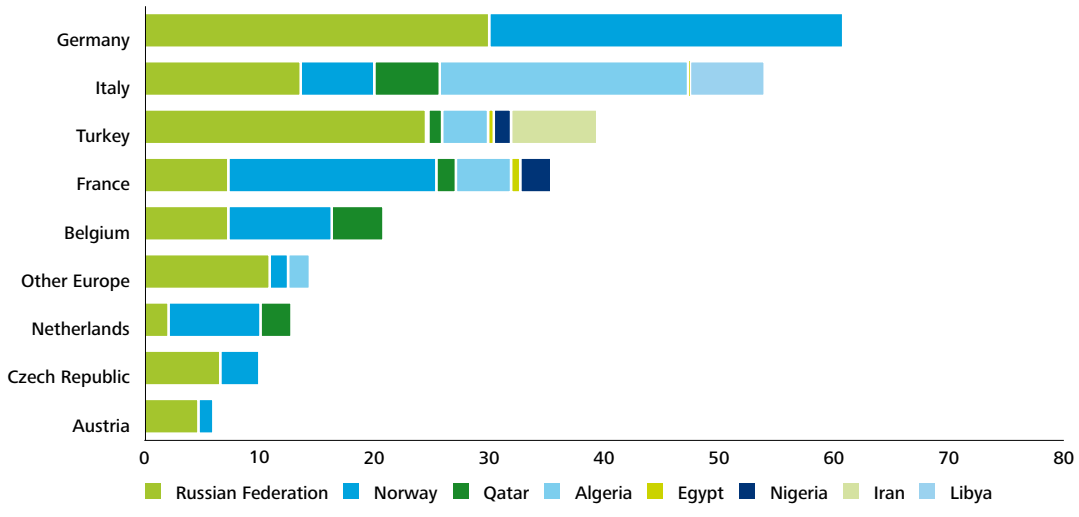
Fight for market share in Asia Pacific

Asia Pacific is a hot bed of demand growth. Between 2012 and 2035, 72% of the world's demand growth for liquids is expected to come from Asia Pacific.[57] This growth will be mainly driven by gains in the transportation sector. Meanwhile, rising electricity consumption and the movement away from coal and nuclear power generation by some Asian nations is expected to enhance further the region's robust energy demand profile.

Countries in Asia Pacific are currently OPEC's main customers, purchasing 57% of its crude oil exports in 2012.[58] And the region is poised to become even more important to OPEC since US demand is declining. Beyond OPEC, other exporting nations are also looking to Asia Pacific to absorb additional crude oil supplies from the Americas, Russia and Central Asia.

In terms of natural gas, Asia Pacific, led by Japan, is the largest importer of the fuel. While demand growth in Japan is expected to slow, China, South Korea and Malaysia are expected to use more natural gas in the coming years. Exports from Malaysia and Indonesia are expected to decline due to depletion and increasing domestic consumption.

European gas imports from Russia, Norway and Africa and Middle East



Source: BP Statistical Review of World Energy 2013

However, the current Middle Eastern suppliers to the region – Qatar, Oman, the United Arab Emirates and additionally Nigeria – will face competition not only from new LNG export facilities opening in Australia and East Africa, but potentially from the US in the second half of the decade. Russian LNG projects in planning and construction will also aim to capture some of this market.[59] If planned export facilities are successfully completed, the Asia Pacific LNG market will become increasingly crowded and highly competitive.

However, demand dynamics in the region are less than straightforward since they are mainly driven by China, the world's largest net importer of crude oil and other liquids. OPEC supplies met the majority of China's needs in 2013, but the country has been seeking greater supply security through diversification. Accordingly, in recent years, it has been investing in domestic infrastructure projects in a number of its own petroleum producing provinces. In the future, if it needs to, China could increasingly look beyond OPEC and Russia for its oil supplies.

The same applies to natural gas. China is increasingly focused on diversifying their portfolio and is choosing to obtain its supplies from a variety of sources, such as importing piped gas from East Siberia and Central Asian countries, as the recently announced $400 billion gas purchase deal with Russia's Gazprom demonstrates. For example, a new branch of the main Central Asia-China Gas Pipeline is expected to be operational by 2016. This branch will transport gas from the large Turkmenistan Galkynysh gas field to China, increasing the volume of shipments to 65 bcm by 2020.[60] In addition, the speed and magnitude of China's own shale development efforts will also affect its future appetite for natural gas imports.

As Asia Pacific's market power increases so does its strategic importance. This portends a greater focus on protecting potential choke points for oil and gas trade routes, such as the Strait of Malacca between Malaysia and Singapore, as well as heightened tensions in the South China Sea where territorial claims are often made and subsequently disputed. The Sea is not only important for strategic reasons but also for its potentially large, and yet-to-be-exploited, oil and gas resources.

Our view

New sources of supply will shake up the global hydrocarbon markets in the next decade. Increased US domestic output, as well as production growth in Canada, Mexico, Brazil and Kazakhstan, will re-shape global oil and gas markets and the geopolitical landscape.

The dominance of traditional producers, mainly OPEC countries and Russia, will be challenged, and they will be forced to compete more aggressively to maintain their market share and influence.

From the demand side, the Asia Pacific oil and gas markets have accounted for the majority of demand growth over the past decade and the upward trajectory is expected to continue. This makes the region, and the nations within it, strategically important. Their ability to absorb new supplies is likely to have a major impact on global geopolitics and international trade.

Future developments in the Asia Pacific oil and gas markets will be driven by what the main customer, China, does next to meet its growing energy needs and to enhance its energy security. While Chinese oil and gas demand is forecast to increase significantly over the next decade, the nation may opt to increasingly tap emerging sources outside the purview of its traditional suppliers, such as oil and gas from Central Asian countries; its own domestic shale production; or alternative energy sources, such as renewables, nuclear and hydro, to diversify the energy mix.

Future developments in the Asia Pacific oil and gas markets will be driven by what the main customer, China, does next to meet its growing energy needs and to enhance its energy security.

Energy mix – A change in the global order

The global energy mix is continually evolving, with one fuel dominating each era. It started with firewood, which was followed by coal. The last two decades, however, belonged to oil, which accounted for 36% of global energy consumption in 2012. This proportion has remained constant over the last 20 years, even with 50% growth in global energy consumption during that period.[61]

Recently, certain incidents have affected both the supply and demand sides of the energy equation. These include lower demand growth in developed economies since the 2008 global financial crisis, increased oil and natural gas production from US shale plays, the Fukushima Daiichi nuclear accident in Japan, social and political unrest in the traditional energy-producing countries (i.e., the Middle East and Africa), the decline of CO_2 prices in the European emissions trading system, and the exponential renewable energy growth in Europe and Asia. Balancing energy supply and demand in light of these events has led the world to the brink of a new era that will soon determine the next order of fuels in the global energy mix.

Supply diversifies

Until early 2000, the Middle East and Africa primarily accounted for any additions to worldwide oil and gas reserves as well as any notable production increases. But in less than 20 years, the focal point of new supply activity has shifted to the West. Here, two new supply regions have emerged, expanding the world's base of economically recoverable resources and boosting production growth. The global reserves-to-production (R/P) ratio, for instance, has increased from less than 50 years in the late 1990s to 55 years in 2012, primarily driven by unconventionals in North America, and pre-salt and heavy oil discoveries in South America.[62]

Although South America has added more reserves than North America, the latter has converted its new finds into production faster than its neighbors to the south. This is because developing unconventionals, primarily shales, is quicker and less expensive than developing pre-salt and heavy oil. In only a few years, unconventional production in the US has transformed the nation from a major importer of natural gas into a net exporter of it.

The shale boom in the United States has not only elevated the rank of natural gas within the global supply mix, but it has also given confidence to other countries with significant shale gas reserves (e.g., China and Argentina) that they can emulate this activity in their own nations. Proliferation of LNG facilities across the globe is further augmenting this regional supply diversity. Since 2006, five new countries began exporting LNG, thereby increasing supplies by 50% to 237.7 million tons per annum (MTPA) in 2012.[63]

Growth of renewable and nuclear energy in select regions has also altered the supply side of the equation. Global renewable and nuclear production grew at a CAGR of 17% between 2007-2012, driven by large capacity additions in Europe, the United States, and China.[64] In an effort to meet strict emissions targets, the European Union intends to continue to increase the share of alternative fuels in its energy supply portfolio. Other countries will likely follow suit as renewable technologies mature.

Demand mix evolves

The consumption patterns of developed economies are becoming more distinctive. As a result of the US shale gas boom, the United States is transitioning from an import-dependent, oil-based economy to energy self-sufficiency, with natural gas playing a much greater role in the nation's energy mix (see figure overleaf). Europe, on the other hand, is extending its lead in clean fuel consumption. Emissions-free sources comprised 11% of Europe's energy consumption in 2012 and the region is working towards achieving its target of 20% by 2020. Japan is also making changes. After the Fukushima Daiichi nuclear accident in March 2011, the nation has diversified its energy mix by importing more natural gas and keeping the proportion of coal in its energy portfolio steady at 25%.[65] Although imported natural gas has almost entirely replaced nuclear power in Japan, which accounted for about 30% of its energy mix before the accident, nuclear may soon regain its footing. Some Japanese utilities have already filed applications with Japan's new Nuclear Regulation Authority for restarting a few reactors,[66] and it continues to be a key baseload power source under the nation's new Basic Energy Plan.[67]

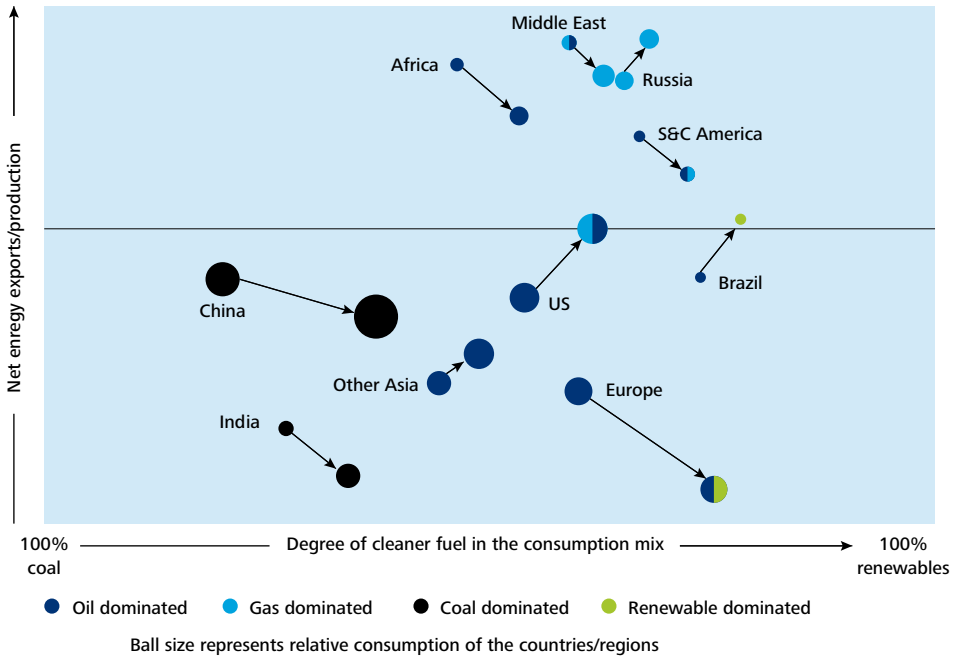
In an effort to meet strict emissions targets, the European Union intends to continue to increase the share of alternative fuels in its energy supply portfolio.

Energy demand among traditional exporting nations will be guided by where each stands on the economic development ladder. Russia's consumption will remain gas-heavy due to widespread availability, relatively low demand growth, and nascent renewable technologies in the country. Of note, the country has recently proposed its first ever state-backed subsidy for renewable energy, offering subsidies to 39 clean power ventures with a combined capacity of 504 megawatts.[68] The Middle East will increasingly move toward clean-burning natural gas as well. Energy demand is expected to rise sharply in this region, driven by population growth, increases in per capita income and modernization, which will lead to higher energy requirements for transportation, industrialization, and electrification. This sharp increase in demand at home will cut into the region's export capacity. A similar situation is developing in Africa. Here, electricity consumption is expected to grow the fastest due to population growth and urbanization, which will enlarge the proportion of natural gas and renewables in the region's energy mix.

The emerging economies of China and India tell a different story. Despite strong growth in natural gas and renewables, the energy mix in these nations is not expected to change significantly over the next few years and it will still be dominated by coal. Why is the status quo expected in these nations when they could benefit greatly from a shift toward cleaner-burning natural gas? Indeed, China plans to boost the share of natural gas in its energy portfolio to reduce pollution and diversify its fuel mix. As outlined in its 12th Five Year Plan, the nation has set a goal to double its share of natural gas in its energy portfolio from just 4% in 2011 to 8% in 2015.[69] India too has similar ambitions. Nonetheless, the expense of natural gas imports and lack of sufficient pipeline and distribution networks will limit the role natural gas can play in these economies. Instead, China and India will have little choice but to continue to rely on coal, which is both abundant and cheap, for meeting their immediate and growing power generation needs. Accordingly, estimates from leading analysts and market participants suggest coal will continue to account for about 45–60% of the region's energy mix.[70]

Energy demand among traditional exporting nations will be guided by where each stands on the economic development ladder.

Dominant fuel transition in the energy consumption mix



Sources: EIA, International Energy Outlook 2013, July 2013; BP, Energy Outlook 2035, January 2014; Exxon Mobil, The Outlook for Energy: A View to 2040, 2014

Note: In this graph, nuclear is clubbed under renewables.
Transition refers to the period until 2035.

Implications for the oil and gas industry

The shifting energy supply and demand equation will affect industry participants in terms of commodity prices, trade patterns, policy development, and technology deployment.

Commodity prices

Since 2011, crude oil prices have become more stable, with Brent prices averaging close to $110 per barrel in each of the past three years. This stability was surprising considering OPEC's spare capacity fell from 6 MMbbl/d in 2002 to below 2.75 MMbbl/d during 2011–2013 – not to mention many energy producing nations experienced political turmoil, and production dropped in non-OPEC countries as well (i.e., the North Sea and the Former Soviet Union).[71] The reason: Rising tight oil supplies in the United States and increases in Iraqi production are providing a cushion for global markets, counterbalancing supply tightness and disruptions around the world.

The growing R/P ratio and increasing diversity of supplies (i.e., the United States, Canada, and Brazil) will likely keep oil prices stable in the near-term. The US EIA forecasts Brent prices will remain in the range of $90–100 per barrel (in 2012 dollar terms) until 2020.[72] This expected price stability bodes well for the industry, as industry drilling programs and consumer demand remain near the mean.

Natural gas prices, however, will likely be more volatile as natural gas contracts and pricing mechanisms adjust to the rapid changes in the industry. For instance, the shale boom has decoupled gas prices from oil in the United States, pushed European producers to consider hub-based pricing to remain competitive, and sparked discussion among Asian importers about reducing oil-indexation.

Statoil, Europe's second-largest gas supplier, offers a case in point regarding the magnitude of these shifts. The company's UK, Dutch and Belgian contracts now reference prices at regional gas hubs. More specifically, the new contracts reference a mixture of day-ahead, month-ahead, and season-ahead prices at hubs such as the National Balancing Point in the UK and the Title Transfer Facility in The Netherlands. Although European producers are ceding ground on oil indexation, prices at European gas hubs have rallied strongly toward it. Why? The region competes with Asia for LNG imports, where prices remain indexed to oil due to lack of local gas hubs.[73]

Similarly, customers in Asia-Pacific are trying to narrow the divide in gas prices between regions by demanding price flexibility clauses with greater linkage to Henry Hub prices from new LNG exporters in the United States. The gap, however, will likely remain due to high shipping costs and the expenses associated with converting and re-converting gas. For example, in large offshore projects, midstream (i.e., gathering and transportation pipelines) and downstream (i.e., liquefaction) costs comprise up to 70% of the integrated supply cost.[74] Shipping costs between regions similarly account for 10–20% of the total cost.[75] Collectively, the costs for procurement, liquefaction, shipment and re-gasification translate into an "Asian premium" of $2–$4 per MMBtu.[76] This regional pricing variation will likely keep re-export and trading options open worldwide.

Trade patterns

Growing domestic production of tight oil in the United States as well as rising Canadian output will reduce North America's reliance on foreign oil. Most of the oil trade in the region will take place between Canada and the United States, with limited imports from other regions. Simultaneously, rising consumption in the East, particularly in China and India, will increase the need for imports and attract more oil supplies. As a result, most of the oil exports from the Middle East, West Africa, and Latin America that were once bound for the United States will now be diverted toward the East.

Simultaneously, rising consumption in the East, particularly in China and India, will increase the need for imports and attract more oil supplies.

While oil trade has traditionally been global, natural gas trade has historically been regional. This trade encompasses intra-regional flows, such as those from Canada to the United States, and those from Southeast Asia and Australia to East Asia. It also includes inter-regional flows such as those from Russia to Europe and from the Middle East to East Asia mainly via pipeline. However, large-scale development of LNG projects worldwide is enhancing the fungibility of natural gas in the international market.

Global LNG trade has more than doubled from about 14 billion cubic feet per day (Bcf/d) in 2000 to over 30 Bcf/d in 2012.[77] Despite recent slowdowns due to project delays, force majeure, and limited new starts ups, global LNG trade is projected to pick up again after 2015 as more than 8 Bcf/d of new LNG capacity comes online in Australia and LNG exports begin from North America. In the United States alone, more than 35 liquefaction projects had been proposed, representing nearly 40 Bcf/d of capacity. According to Deloitte MarketPoint, global LNG export volumes are projected to double to 62 Bcf/d between 2013 and 2030.[78]

LNG is increasingly being traded in the spot market due to regional price differentials that provide arbitrage opportunities and a shift toward destination-divertible contracts that allow companies to re-sell or re-export volumes. Spot and short-term trades have therefore increased from less than 5% in 2000 to 27% in 2013.[79] Qatar and Nigeria exported more than half of the total spot and short-term LNG volume, and Asia received about 70% of it.[80] Globally, a total of 75 cargoes were re-exported in 2012 compared to 44 in 2011.[81] Most re-exports were from European countries, such as Spain and Belgium. The growth in spot trade, along with the movement toward contracts with divertible options, is pushing LNG cargoes and receiving facilities toward standardization, which is an important characteristic of a global commodity.

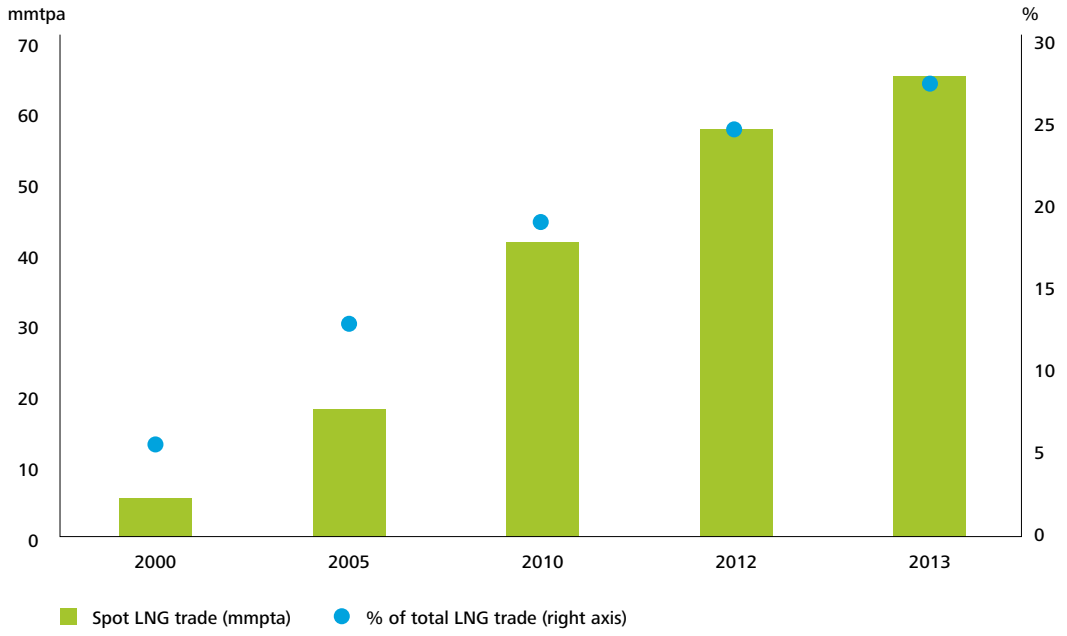
Nonetheless, LNG projects must still navigate many obstacles before coming to fruition, such as enormous upfront capital investments, financing arrangements, long construction periods, technical maintenance, and regulatory approvals. Under these conditions, traditional LNG exporters will be reluctant to move away entirely from long-term contracts. Extended agreements offer advantages to LNG importers as well, especially in an environment where uncertainty still exists concerning the availability of LNG supplies. Some LNG importers, therefore, will still prefer long-term bilateral contracts to enhance their energy security. In summary, like oil, gas will increasingly trade in the international market, but a complete shift toward spot or short-term contracts is unlikely. This would require technological advancements or other innovations to reduce the substantial costs associated with LNG trade, including those related to transportation, storage, loading and re-loading.

Policy development

Developed economies such as the United States, which is at the cusp of achieving energy self-sufficiency, will focus on policies that encourage environmental sustainability, such as those that promote energy efficiency and renewable resources, and encourage greater use of clean fuels in the transportation sector, thus decreasing reliance on oil.

Global LNG trade has more than doubled from about 14 billion cubic feet per day (Bcf/d) in 2000 to over 30 Bcf/d in 2012.

Spot and short-term (< 5 years) LNG trade and share of total LNG trade since 2000[84]



Source: International Group of Liquefied Natural Gas Importers, The LNG Industry in 2013, March 2014

In comparison, economic growth and energy access will initially drive policymaking in the import-dependent economies, but in the long-term, fuel diversification and environmental protection will gain more attention. Europe, for instance, increased the share of coal in its energy mix as carbon prices declined due to an oversupply of carbon credits and greater availability of cheap coal from the United States. However, policies favoring clean fuels will likely prevail in the long run. Europe's commitment to reduce CO_2 emissions by 80–95% through 2050 (compared to 1990 levels) will require coal-fired generation to be completely phased out, unless the carbon emissions associated with it can be captured or eliminated.[82]

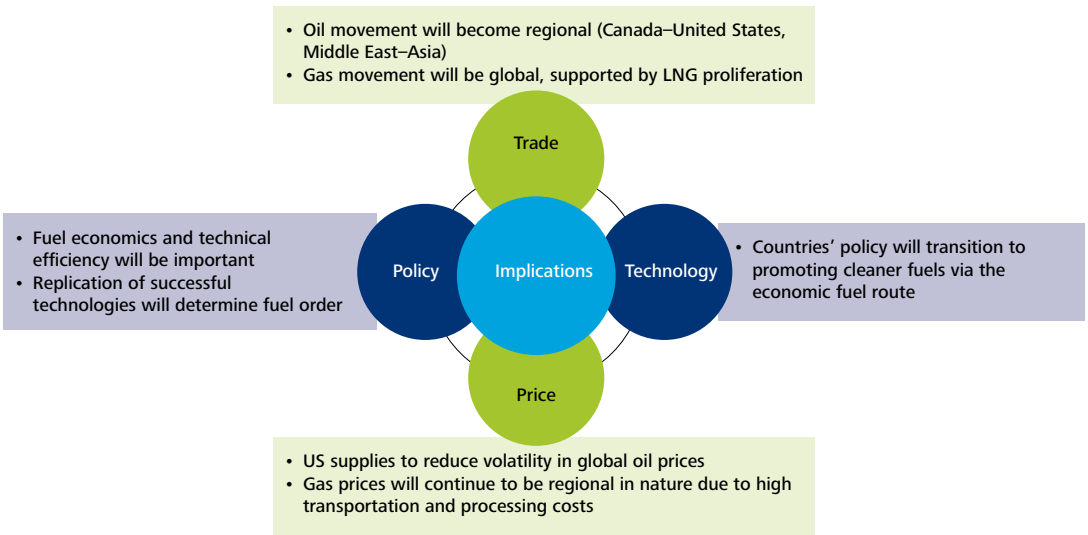
While coming under pressure elsewhere, coal maintains a favorable outlook in China and India. These nations will remain dependent on coal, as well as oil, for a long time, due to the accessibility, security and affordability of these fuels. In 2013 alone, China approved the construction of 15 coal projects with a capacity of 100 MTPA.[83] The Chinese government, however, does have its eye on the environmental challenges associated with coal-fired generation. Accordingly, it has announced plans to reduce the share of coal in its energy mix to 46% by 2030, and simultaneously to increase the use of clean energy.[84]

Technology deployment

Technology, both in terms of advances and maturity, often determines the competitiveness of a fuel. New technologies enabling high-resolution sensing and monitoring of fractures in shale wells will likely improve production economics and reduce completion costs, thus elevating the ranking of shale gas in the global fuel order. The movement toward natural gas largely comes at a detriment to coal. Therefore, improvements in clean-coal technologies, such as carbon capture and storage (CCS), must be rapidly developed if the global outlook for coal is to improve in the long-term. Meanwhile, the maturing of renewable technologies, such as solar and wind, has led to significant cost reductions, increasing their competitiveness with other fuels in some regions; however, many of these technologies remain dependent on subsidies and/or fiscal policies. Advances in energy storage technologies as well as forecasting and optimization applications are also helping renewables to overcome challenges associated with intermittency. Progress on all of these fronts will need to continue in order for renewables to gain more ground against fossil fuels in the global energy mix.

How well technologies can be replicated and transferred from one part of the world to another additionally affects the competitive landscape. For example, China, a major demand center, has huge shale resources but a more complex geology, political environment, legal structure, and industrial environment than the OECD world. Can hydraulic fracturing not only be demonstrated but also accepted there, and elsewhere? This question has yet to be answered, but once determined, it will profoundly influence the global fuel order.

Supply-demand change implications



Source: Deloitte analysis

Our view

The global energy mix is shifting toward cleaner fuels such as natural gas. In North America, natural gas is increasingly being used in power generation, manufacturing, and transportation. Japan also plans to increase the share of natural gas in its power mix, continuing a course that was set after the Fukushima Daiichi accident forced a pause in its use of nuclear power. In Europe, the desire to adopt cleaner fuels will continue despite some recent backtracking on more costly renewable sources, which has temporarily driven the region toward greater consumption of coal. As part of its long-term commitment to clean energy, Europe will increase the proportion of natural gas in its energy mix, while mitigating the risk of dependence on supplies from Russia by increasing imports of LNG, building gas pipelines from Central Asia and North Africa, and integrating its natural gas pipeline infrastructure to include more west-to-east flows. Meanwhile, Russia will continue to use natural gas for the lion's share of its energy needs, and the Middle East can be expected to move gradually towards natural gas as its economy modernizes. Only emerging Asia will run counter to the global "dash-for-gas" as it remains dominated by coal.

While natural gas markets are becoming more international, the global oil trade is moving toward regionalization. OECD countries are hitting "peak demand," with liquids demand rising just 2% between 2011 and 2040. The North American oil market will continue to diverge from the international market as rising liquids supplies in the region increasingly provide a cushion for diminished spare capacity in Saudi Arabia. With rising tight oil production in the United States, the US will become a "swing producer," steadying oil prices and providing companies with a more stable environment for making investment decisions. The European Union nations will source crude from Russia, the Middle East and North Africa, supplemented by domestic production. Growing Asian liquids demand will be met from the fringes of the Asia Pacific region, with Middle East and Central Asian supplies coming from the West and Latin American cargoes arriving from the East.

The growing surplus of resources in one part of the world and rising demand in the other has led to a major shift in the oil and gas industry. This changing supply-demand pattern will rearrange the order of fuels in the global energy mix in favor of natural gas. This will significantly impact energy industry participants, as it has implications for commodity prices, trade, policies, and technology.

In Europe, the desire to adopt cleaner fuels will continue despite some recent backtracking on more costly renewable sources, which has temporarily driven the region toward greater consumption of coal.

Energy production – Oil and gas megaprojects call for new project management strategies

Oil and gas megaproject reserves, those holding more than one billion barrels of oil equivalent, can be broadly grouped into three categories: traditional, new-age, and unconventionals. Traditional projects comprise onshore, shallow water and heavy oil; new-age projects encompass LNG, gas-to-liquids (GTL), deepwater and Arctic; and unconventional projects refer to shale, tight oil and oil sands in Canada.

Limited growth prospects with traditional reserves and the economic boom of the early 2000s moved capital expenditure towards new-age projects, but a series of delays and cost overruns deflated the industry's enthusiasm for these efforts. For example, the Gorgon LNG project in Australia, earlier estimated at $37 billion USD, reported a 40% cost blowout and delays of almost a year.[85] Similarly, the cost of the Pearl GTL project in Qatar, which came online in 2012, rose nearly 300% from the 2003 estimate of $5 billion USD.[86] And the total cost of the giant Kashagan project in the Caspian Sea, which was delayed by more than eight years, is currently pegged at $136 billion USD from a baseline of $57 billion USD.[87]

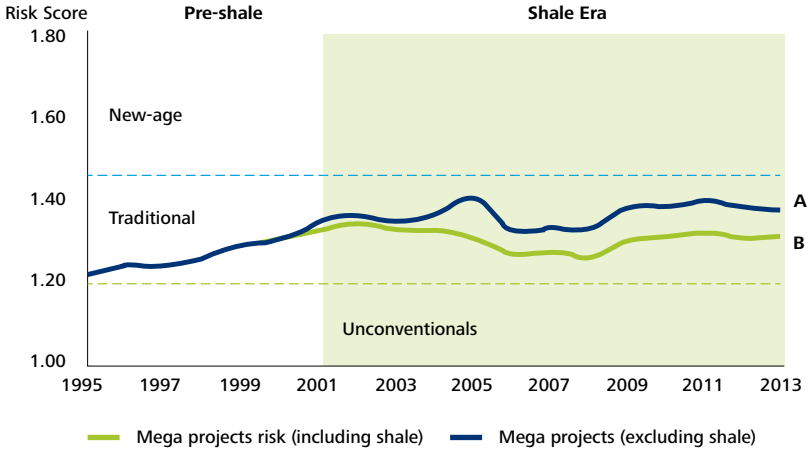
Flat crude prices and subdued global demand since the financial crisis of 2008 are further challenging the development of new-age projects. Actual 2010 global oil and gas demand of 293 quadrillion Btu was 5% lower than the pre-crisis estimate from the US EIA of 307 quadrillion Btu. Recent EIA estimates forecast global oil and gas demand to grow to 310 quadrillion Btu by 2015, which is nearly 10% lower than the Agency's 2006 estimate for that year.[88] But, the ultimate challenge for new-age projects arrived in the form of the US shale boom and the rapid growth of unconventionals.

Shale boom pushes new-age projects to the periphery

New-age projects make it possible to access stranded and undeveloped reserves, but they come with higher technical complexity and risks. Hostile operating conditions in frontiers such as the Arctic and ultra-deepwater require cutting-edge technologies. These new frontiers also present several operating challenges, such as the formation of gas hydrates due to the high pressure and near-freezing temperatures. These substances can impede the flow in wells and increase the risk of blowouts. As a result, the reserve weighted risk score of megaprojects was expected to climb along with the proliferation of new-age projects during the early 2000s.

This expectation was never realized. The direction of capital expenditure, as well as the risk profiles associated with them, changed course after 2006 as the shale-boom got underway in the United States. Shale projects use an innovative combination of two existing technologies: horizontal drilling and hydraulic fracturing, often referred to simply as "fracking." Multi-billion-dollar investments by US majors and independent E&P companies led to the rapid adoption of these technologies, and enabled companies to focus swiftly on improving efficiency. In addition, shale is primarily an onshore resource. Thus, megaprojects in the unconventional realm typically present fewer operating challenges than those in the new-age sphere, and they have the additional advantage of being able to use existing infrastructure.

O&G reserves weighted risk score of megaprojects



Per conventional expectations, the average risk profile of mega projects group was likely to be higher due to increased investments in complex new-age projects

A

B In reality, emergence of shale and tight oil is offsetting the development of new-age projects and moderating the group's average risk profile

Source: Company SEC filings, annual reports, and press releases; Deloitte analysis

Note: Based on Goldman Sachs top 360 projects' risk score

The inclusion of shale efforts effectively lowered the risk profile of the entire megaprojects portfolio by pushing riskier new-age endeavors farther out on the spectrum. Consequently, the average risk score of megaprojects in the shale era is estimated to be at par with scores in the late 1990s.[89]

New-age projects call for modern management approaches

The shale era slowed the pace of new-age project development for a number of large US independents, such as ConocoPhillips, Marathon, and Anadarko, all of which diverted funds from their international portfolios to US shale resources.[90] Nonetheless, new-age projects are still contributing to growth in oil and gas reserves. Despite the shale boom, the share of new-age projects among global megaproject reserves is estimated to grow from 22% in the pre-shale period to 30% by 2016. This growth over the long-term will likely be attributable to faster-than-conventional decline rates in shale fields and limited opportunities in traditional areas.[91]

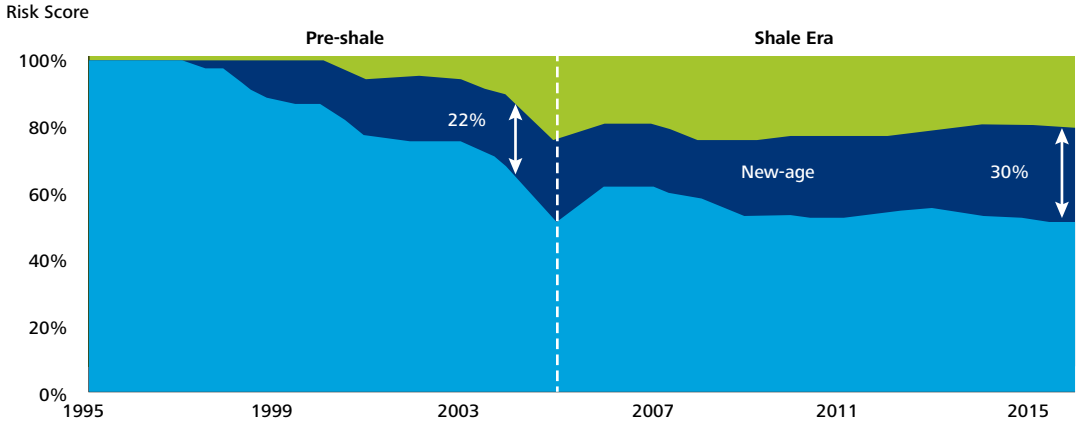
Importantly, new-age projects also play a key role in the long-term growth strategies of integrated oil companies. Four of the supermajors (i.e., ExxonMobil, Chevron, Royal Dutch Shell, and BP) as a group currently spend about 40% of their annual capital on megaprojects, of which over 50% is spent on new-age efforts such as LNG.[92] However, the long lead times necessary to develop these new-age projects often jeopardize the near-term economics of oil and gas companies.

The bottom line, however, is that new-age projects are essential for long-term growth, but their relatively higher risk profiles challenge traditional project management strategies. So, what does it take to manage a new-age megaproject successfully? There is no one-size-fits-all solution. Oil and gas companies can effectively respond to the new types of risks associated with these enormous, cutting-edge capital projects by blending innovative approaches to project management with selective industry best practices.

Companies are increasingly adopting a stage-gate process that enables project decisions to be made as milestones are met, with the results of each successive phase determining the direction of the next. But many are finding that something more is required to alleviate persistent challenges pertaining to cost, schedule, quality, and production. This "something more" can be found in a modern project management strategy that enables management teams to understand the project dynamics, constantly learn, and adapt to changing external factors. This type of strategy emphasizes:

- **Front-end loading** – Dedicating more resources to pre-project planning enables companies to understand better megaproject dynamics, improve predictability, and reduce operational glitches. Robust planning and design, executed early in the project lifecycle, can help minimize design-change costs further in later stages of the project. As Jim Flood, vice president, ExxonMobil Arctic and Eastern Canada, commented: *"All of us feel time pressure to get first production. If you don't get the engineering right, you don't get the procurement right, then you impact fabrication."*[93]

Megaprojects' sanctioned reserves (cumulative since 1995)



Source: Company SEC filings, annual reports, and press releases; Deloitte analysis

- **Lean project management** – This approach is vastly different from the traditional method of analyzing deviations from a static baseline and then expending resources to realign the project to it. Instead, efforts are focused on reaching milestones by redefining the requirements of the project from the current position. In this approach, resources are dynamically adjusted to the needs of the project, which are continually reassessed.[94]

- **Integrated project delivery** – This method evolves beyond traditional contractual models that emphasize a two-party, owner-contractor relationship to integrate the full range of project participants, including owners, engineers, contractors, and major suppliers, into project teams. These integrated teams are generally more capable of managing changing circumstances whilst minimizing commercial conflicts than conventional two-party relationships. Engaging participants from project inception to final closeout also helps them to understand better the project. The preferred contracting strategy in this method aligns participants' commercial objectives with the project's success as well as weighs collective team performance against individual performance.

- **System of operational excellence** – The overarching goal of the system of operational excellence (SOE) is to improve project performance by providing enhanced, real-time insight into project status so that problems can be identified in time to implement mitigation strategies. The SOE also promotes efficiency and effectiveness by providing easy access to relevant and reusable information, tools, and lessons learned from prior capital projects. Development of a knowledge ecosystem is crucial to capturing, analyzing, and reusing large amounts of capital-projects data. However, identifying industry best practices is one thing, while sharing them is another. Leading companies are using emerging technologies to enhance collaboration by facilitating a free flow of project information among project participants.

Leading industry practices suggest modern megaproject strategies should, at a minimum, include: enhanced upfront engineering and planning, an agile project monitoring and evaluation methodology, increased integration and collaboration between project participants, and a system of emerging technologies, tools and experiential knowledge to promote operational excellence.

Our view

Megaprojects, mainly new-age ones, are going through a tough phase due to a series of cost overruns and delays, flat crude prices, and competition from less-risky unconventional alternatives. New-age projects, nonetheless, will continue to remain an integral part of the oil and gas industry's growth strategy over the long-term as conventional fields decline and shale growth moderates.

Modern project management strategies will increasingly be required if oil and gas companies are to reap the benefits of new-age projects. Each new-age megaproject presents unique challenges so no "catch all" method exists, but guidelines are emerging. Leading industry practices suggest modern megaproject strategies should, at a minimum, include: enhanced upfront engineering and planning, an agile project monitoring and evaluation methodology, increased integration and collaboration between project participants, and a system of emerging technologies, tools and experiential knowledge to promote operational excellence.

Energy nationalism – Driven by greed, fear, and pride

Resource nationalism essentially results from a tug of war amongst three basic human drives: the desire for wealth as resources are monetized (greed); the desire for energy security since modern societies are very dependent on energy (fear); and the desire to maintain national sovereignty over one's resources for purposes of national development (pride). Every country wrestles with these opposing and conflicting agendas at some point, reflecting changing national endowments, local development objectives and national priorities.

Resource nationalism in context

Modern resource nationalism, at least in the oil and gas context, has undergone a fundamental change since the 1970s, following the OPEC oil crisis. Prior to that time, international oil companies (IOCs) were largely free to pursue resources regardless of location. National governments controlled merely 10% of global reserves. Today, conventional oil and gas reserves are almost entirely controlled by their respective national governments. This applies to all of the Middle Eastern oil-based economies as well as Russia, Indonesia, Malaysia, Mexico and Venezuela. Indeed, 89% of known conventional resources are now restricted.[95] Only a very few basins today, mainly Canada, Australia and the North Sea, are truly open to international access. In response, many resource-constrained countries (e.g., South Korea, China, and Taiwan) have established their own national oil company (NOC) champions to secure energy for their growing economies and protect themselves from supply disruption. Unsurprisingly, commodity prices have risen, reflecting the restrictions on supply and the global increase in demand.

IOCs have historically traded their considerable prowess in executing large capital projects and in deploying technology for access to resources. This model is now under strain given the emergence of global oilfield services (OFS) companies with their own research and development programs and commercial models. Furthermore, for many IOCs, the size of their finds has been falling and production costs have been rising, corresponding with a shift in focus to unconventional basins. In general, NOCS, with their scale, have been able to access capital, resources and markets at lower cost and with greater ease than IOCs.

Finding a new balance

Despite the ever-changing power dynamics between NOCs and IOCs, trade flows had settled into a stable pattern over the last couple of decades – liquid and gas exports from Russia to Europe; Middle East exports to North America and Asia; and large continental markets for gas in North America and OECD Europe. Furthermore, a "who's who" of importers and exporters had been established. But, in only a few short years, a series of largely unexpected developments have disrupted these patterns.

Today, few countries continue to be true exporters of all manner of hydrocarbons. Only the Middle Eastern OPEC countries, Russia and Canada export more oil and gas than they consume. Parts of Africa, as well as Australia and New Zealand, export gas, but import oil. Venezuela and Mexico export oil but import gas. Finally, OECD Europe, Brazil, India, China and the US import both.[99] Resource nationalism, it seems, can cut both ways, constraining the economies of the protectionists as well as supporting them.

In the next few years, these patterns will shift further. Traditional all-around importers (e.g., the US for gas and liquids, and Brazil for liquids) are becoming exporters. Conversely, some former exporters, such as Indonesia and Malaysia, are becoming importers. The resource poor (e.g., China, Poland, and Ukraine) could become the resource rich if their shale resources play out.

Three macro factors are behind these shifts:

1. Technology, the great equalizer, has helped to unlock new sources of hydrocarbons that were formerly viewed as inaccessible. In the past 10 years, consider the list of new technology developments that have entered modern lexicon: horizontal drilling, multi-stage fracking, methane hydrates, pre-salt, floating liquefied natural gas (FLNG), and floating production storage and offloading (FPSO). Technology moves across borders with surprising speed, and is sometimes applied with shockingly disruptive effects. Technology is largely behind the dramatic shift in the supply of hydrocarbons, converting importers to exporters, and setting up many other economies with promising geology to change potentially their roles in the world (e.g., Mexico, Ukraine, Poland, and China).

2. Improvements in energy efficiency and changing lifestyles are affecting the demand for petroleum products in developed countries. Electric and hybrid engines, passive energy capture, battery technology, high efficiency turbines and the internet are coalescing to decrease consumption and free up supplies of petroleum to seek new markets. The amount of energy input per unit of GDP is fundamentally shifting and shrinking. In the future, similar trends may develop in large, emerging economies, such as China and India, as they increasingly address worrisome air-quality issues.

3. The demographically driven rise of the Asian economies is altering a global demand pattern that has been in place for four generations. The absolute size of these nations is exerting its own kind of gravitational pull for hydrocarbons. The large share of petroleum products in their energy mixes and declining European demand, is strengthening this draw. For example, on an energy equivalent basis, China only needs to swap 3% of its annual thermal coal demand for natural gas in order to trigger over 75 million tons of new, annual LNG demand[96] – about the same volume as all of the Australian LNG projects under development today.[97]

Modern resource nationalism

These changes are giving rise to a modern version of resource nationalism that in some ways is not as strict and in others is more so.

Regardless, it will likely be characterized by the following developments:

- **Long-restrictive borders are opening up.** Access to technology and know-how are critical to expanding petroleum production in the unconventional resource plays, as well as to improving recoveries from mature basins. Borders that were previously closed are showing a new openness to joint ventures, technology transfers, R&D, and cooperative agreements to take full advantage of the technologies offered by OFS companies and IOCs. Examples include PetroChina and Shell ventures in China; Chevron projects in China; Russian collaboration on LNG with ExxonMobil and Shell; Shell and Chevron projects in Ukraine; and the rapid rise of East Africa particularly Tanzania and Mozambique. And, this is probably just the beginning, since the benefits are multi-faceted. Cross-border arrangements such as these will help some nations reduce their net import balances. Oilfield services companies should also benefit from the opportunities to take their technologies into new markets. As the industry reaches into previously inaccessible areas, the demand for infrastructure (i.e., pipelines, processing, and storage) will also increase, especially in countries not accustomed to such growth. The oil and gas industry has historically taken a global approach to its behavior and outlook, and the years ahead suggest it will do more of the same, generating ever-increasing levels of connectedness and inter-dependence. And presumably, the world will be a safer place for it.

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- **National market champions face competition.** The power of technologies to unlock hydrocarbons promises to transform dramatically energy security, national wealth and domestic growth for many nations. Governments will take notice, and challenge whether their generally protected domestic markets would be better off with more open access, of a sort. Some of these changes would have historically been viewed with deep suspicion, but today, there are more than a few examples of governments opening up their borders to more competition. One example is Mexico, which has long restricted domestic oil and gas activities to its national market champion, Pemex. Following years of flat growth in its hydrocarbon reserves and production, and facing the prospect of needing imports, Mexico's government has finally begun to loosen the restrictions on its domestic oil and gas market. Similarly, Russia passed new rules that limited Gazprom's national export monopoly to its major western market, Europe, and opened up its eastern markets to new competitors. China too has announced plans to relax domestic-market restrictions in an effort to promote LNG imports from new players and improve the national gas distribution infrastructure. Many more national governments are expected to act in a similar fashion, which would subsequently encourage national market champions to seek insight from IOCs and experienced OFS companies.

- **Infrastructure investments will grow.** As countries switch from being resource rich to resource poor, or the reverse, they will have to reorient their infrastructures. As a prime example, consider the North American oil and gas infrastructure layout. For many decades, the continent imported energy, and most transport routes pointed inward to the middle of the continent. Canadian pipelines, for instance, directed crude and gas to Chicago, and US pipelines, originating in the Gulf of Mexico, moved products toward the industrial heartland. Today, Canada and the US have long lists of export-oriented oil and gas projects, ranging from five LNG projects on the Canadian west coast,[98] to 20+ LNG projects in the US[99] principally, but not exclusively, on the Gulf Coast. LNG re-gasification facilities are being repurposed into liquefaction facilities. Pipelines are being repurposed and reversed, such as Enbridge Line 9 and the TransCanada Mainline. Similarly, Russian gas infrastructure has principally been directed westward to meet the needs of the European market. In the future, it will be directed more towards Asian markets, with some LNG liquefaction facilities in Malaysia likely being repurposed for re-gasification.

- **Control of the resource is the dominant theme.** With fossil fuels expected to continue to dominate the global energy mix for decades, resource ownership appears to be in the national interest for years to come. Few countries will permit outright foreign government ownership over their resources although there is likely room for some creative deal-making. This can take the form of providing access to upstream resources in exchange for privileged access to a large consumer marketplace, such as the arrangements between China and some African nations. Even more-liberal resource-rich nations are clamping down on foreign resource ownership. Canada, for instance, has refused any further national government ownership of its resources following the Petronas purchase of a Canadian natural gas producer, and the CNOOC acquisition of Nexen. The US too opposes selling its resources outright, although that might change for coal, and continues to view export of its resources with some caution, hence the slow pace of LNG export approvals and sluggish momentum for crude oil exports. Rather than outright ownership, more NOC participation in foreign ventures is expected. These investment flows will generally move inbound to the resource-rich in the US and Middle East (petrochemicals), Australia, Canada, and Russia, and outbound from the resource-poor in China, Korea, Japan, and Taiwan.

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- **Diplomatic profiles change.** Rising energy exporters may well use their new market powers to redefine their roles in global diplomacy. For instance, the relationships between the US and its Middle Eastern allies and with its northern neighbor, Canada, are shifting, as the US becomes a competitor for energy markets. The US military ambivalence to the challenges in Syria, the rise of the Muslim Brotherhood, and the toppling of the governments in Egypt and Libya, are sources of angst for the oil-dependent states in the Persian Gulf. US exports also have the potential eventually to disrupt Russia's captive European markets. Australia too may find itself with more geopolitical influence if it becomes the world's largest LNG exporter as anticipated in about three years' time.

Our View

Three macro factors are shaping the new energy nationalism, and rebalancing the drivers of greed, fear and pride. Technology is opening up new unconventional resources in shale and deep water, expanding supply options, and in the process, creating new exporters. Energy efficiency is slowing demand growth, particularly in advanced economies, and someday it will exert the same effect on emerging economies, further swelling the supply of hydrocarbons. Like gravity, population growth and a rising middle class are pulling oil and gas toward the large, emerging economies in Asia.

Overall, greed and fear are on the rise, and pride is on the wane. The new energy nationalism is being driven by greed for markets amongst the former and emerging exporters and fear about energy security amongst nations with substantial demand. Meanwhile, formerly fearful countries are becoming more confident and assertive by virtue of their newfound resource endowments. Countries with energy deficits, however, are being forced to lower their pride in order to improve their energy security and lessen their fear. As a result, many governments with currently closed markets will increasingly open up, at a minimum allowing more competition within their borders.

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Notes

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