



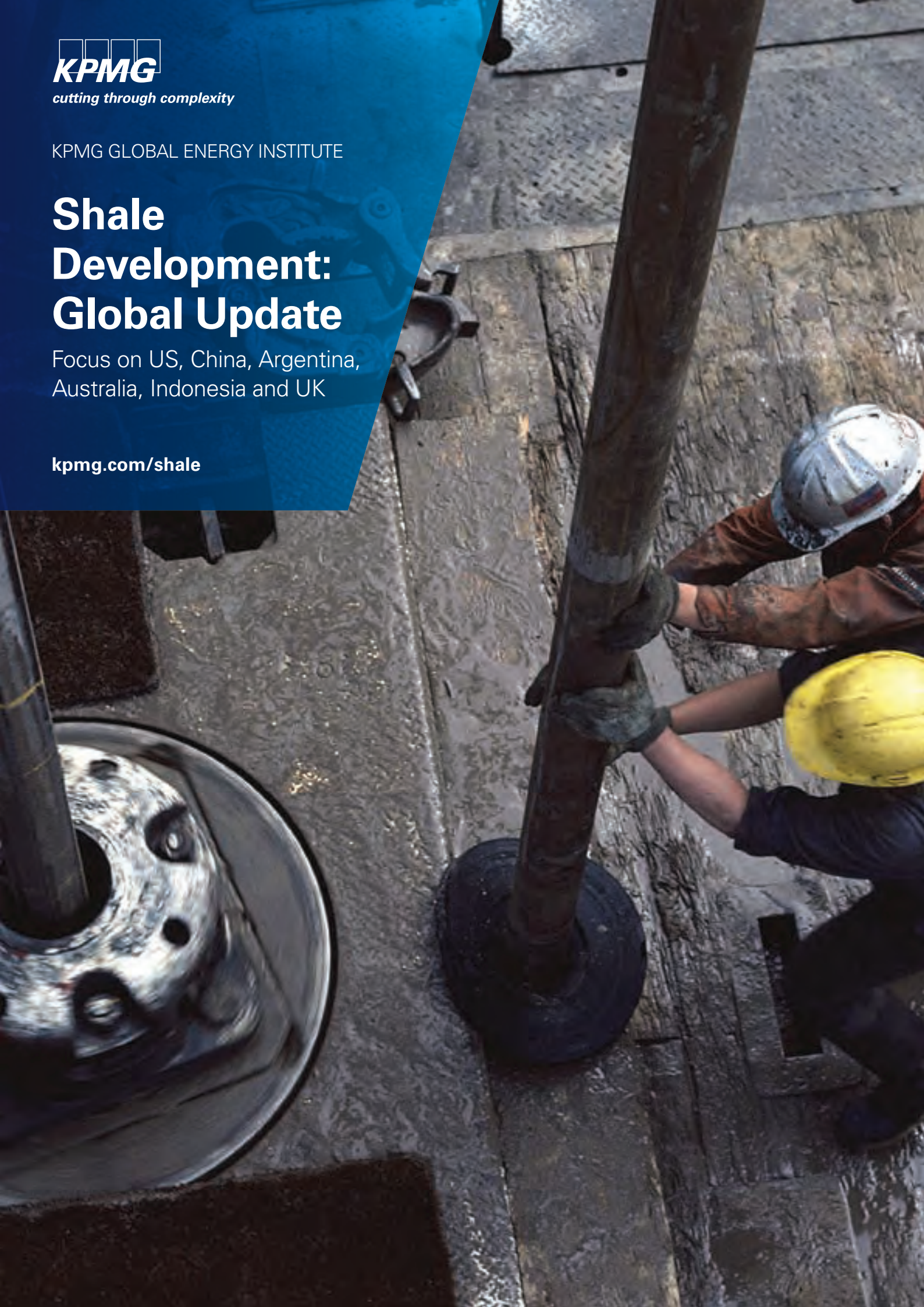
cutting through complexity

KPMG GLOBAL ENERGY INSTITUTE

Shale Development: Global Update

Focus on US, China, Argentina,
Australia, Indonesia and UK

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Introduction

A rapid evolution

Shale is fast transforming itself from 'tomorrow's big thing' to become an essential part of the global energy sector.

Although the US is still way out in front in terms of commercializing this valuable asset, other markets are playing an accelerated game of catch-up, with a series of discoveries and technological advances.

Energy security is the word on every government's lips, with shale promising to bring greater self-sufficiency, significant revenue from industrialization, exporting surplus volumes, and a reduced carbon footprint.

This report discusses the global shale market and looks at developments in the big three – US, China and Argentina – as well as in Australia, Indonesia and the UK. It provides some compelling insights into an evolving sector as well as some pointers to the future shape of global shale markets.

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Summary

- Despite a recent recovery, continued depressed gas prices have led many companies to diversify, shifting their assets towards higher growth, oil and 'wet' plays.
 - Capital continues to flow into the North American market, and is increasingly being allocated to the exploration and development of existing holdings, partly at the expense of M&A activity.
 - With a continued positive outlook for proven unconventional reserves, an overstretched US midstream infrastructure highlights additional concerns over resource accessibility, US export policy, environmental harmonization and water management.
 - Attracted by new discoveries, access to world-leading technology and the prospect of a US industrial revival, foreign buyers, non-traditional players, large independents and majors are all poised to continue their active pursuit of North American shale gas and oil for the foreseeable future.
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- Although the Chinese market has yet to break through to the commercialization phase, the government has ambitious targets for shale output by 2015.
 - As a sign of its commitment to shale, the Chinese government is offering subsidies for development.
 - European and US players are moving into the market in a series of joint ventures, with China's shale exploration and development looking to benefit from new joint venture partners' expertise and experience.
-
- Argentina's significant potential is being held back to some extent by fears over the political and regulatory environment.
 - Substantial infrastructure developments are helping to expand opportunities for both domestic consumption and export.
-
- Although a late developer, the changing dynamics of both domestic and international gas markets have significantly improved shale gas opportunities.
 - High labor costs and a shortage of essential skills continue to be a challenge.
 - A number of deals with overseas partners suggest that the Australian shale sector is primed for take-off.
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- To overcome shortfalls in future supply and gain greater energy security, Indonesia's government is tendering for oil and gas exploration blocks.
 - There are few incentives for developing shale gas, and unclear exploitation rights where site boundaries conflict with conventional oil and gas operators.
 - Despite investing in unconventional blocks to boost production, shale gas development is still in its infancy, and the country will need to import gas for the next 5-10 years.
-
- Despite firm commitment from the government, the UK is many years away from any kind of commercial shale industry.
 - Exploration has been modest and tentative, with considerable opposition to hydraulic fracturing (fracking), making permits difficult to acquire.

US



China



Argentina



Australia



Indonesia



UK



Several other countries are actively exploring the shale oil and shale gas resources available within their borders. The EIA recently released a report on the technically recoverable shale oil and shale gas resources in 41 countries outside of the US. The charts below outlines the top ten countries with the largest resources of shale oil and shale gas as per this assessment. The term technically recoverable resources correspond to the quantity of oil and natural gas that could be produced with present technology, regardless of the costs associated with production and oil and natural gas prices.

Top 10 countries with technically recoverable shale oil resources

Rank	Country	Shale oil (billion barrels)	
1	Russia	75	
2	US*	58	(48)
3	China	32	
4	Argentina	27	
5	Libya	26	
6	Australia	18	
7	Venezuela	13	
8	Mexico	13	
9	Pakistan	9	
10	Canada	9	
	World Total	345	(335)

* EIA estimates used for ranking order. ARI estimates in parentheses.

Source: EIA Technically Recoverable Shale Oil and Shale Gas Resources, 10 June 2013, accessed via <http://www.eia.gov/analysis/studies/worldshalegas/>

Top 10 countries with technically recoverable shale gas resources

Rank	Country	Shale gas (trillion cubic meters (tcm))	
1	China	31.6	
2	Argentina	22.7	
3	Algeria	20	
4	US*	18.8	32.9
5	Canada	16.2	
6	Mexico	15.4	
7	Australia	12.4	
8	South Africa	11	
9	Russia	8.1	
10	Brazil	6.9	
	World Total	207	221

* EIA estimates used for ranking order. ARI estimates in parentheses.

Source: EIA, Technically Recoverable Shale Oil and Shale Gas Resources, 10 June 2013, accessed via <http://www.eia.gov/analysis/studies/worldshalegas/>

FOCUS

on the
United States



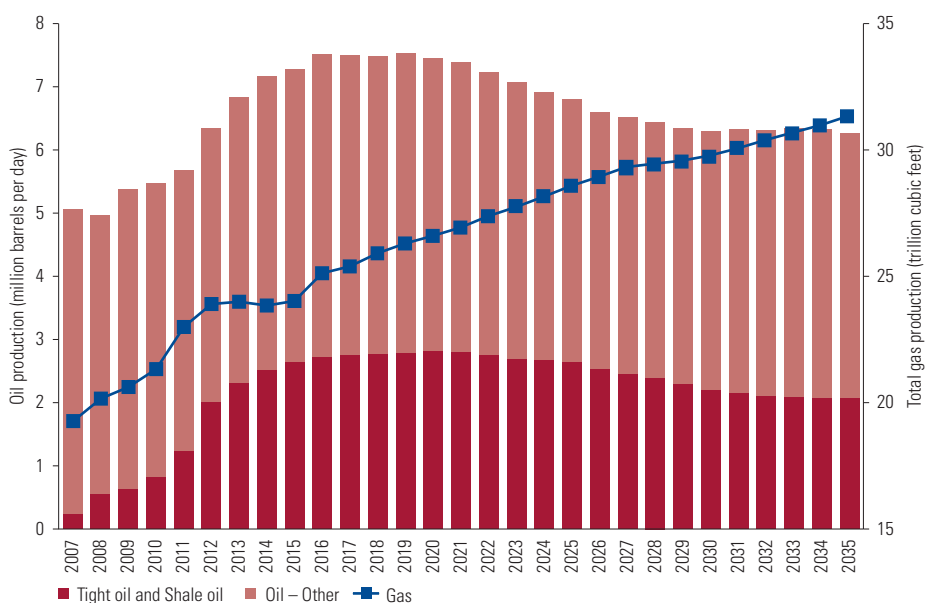
Current environment

Continued discoveries in unconventional oil reserves, coupled with growing production, efficiency improvements and a relatively slow recovery in North American demand, have all contributed to continued depressed gas prices. Despite a recent rally, these low prices have in turn led to a significant decline in dry gas shale development over the past 18 months. After growing from around 500 billion cubic meters (bcm) or 18 trillion cubic feet (tcf) in 2005 to over 650bcm (23tcf) in 2011, US natural gas production is forecasted to remain effectively flat until 2015.¹

Having peaked at well over 12 US dollars (USD) per million British thermal units (mmBtu) in June 2008, prices plummeted to approximately US\$2/mmBtu in April 2012, before rebounding, marginally, to almost US\$4/mmBtu in March 2013.² In the face of such volatility, many operators and investors have shifted their capital investment and asset exposure to the development of unconvensionals, as well as 'wet' gas reserves, which trade at a premium to dry gas.

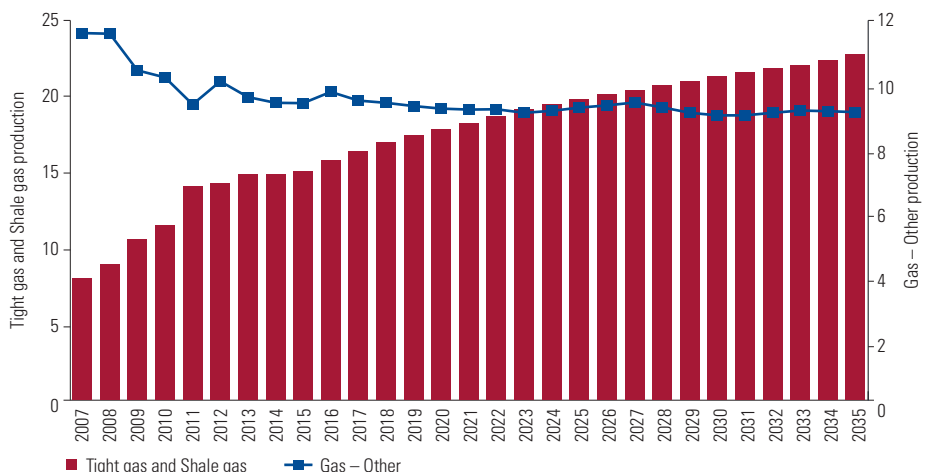
Gas producers have diverted investment to oilfields and even shut in some gas production, while 'wet' gas/oil-intensive basins such as North Dakota's Bakken and Texas' Eagle Ford basins both register high rig counts, and continue to enjoy a disproportionate share of M&A activity. In addition, shale expansion continues, with deep shale structures such as the Texas Cline and California's Monterey, as well as the redevelopment of the Texas Permian Basin.

Total production of oil and natural gas in the US from 2007–35



Source: Energy Information Administration (EIA)

Natural gas production by source (trillion cubic feet)



Source: Energy Information Administration (EIA)

¹ US Energy Information Administration, Annual Energy Outlook 2013, Market Trends, 15 April 2013, accessed via http://www.eia.gov/forecasts/aeo/MT_naturalgas.cfm

² Henry Hub Gulf Coast Natural Gas Spot Price, US Energy Information Administration, 1 May 2013.

Despite the current price of dry gas, certain investors are taking a chance and buying dry gas reserves. Such a bold move is contrary to wider market trends, and reflects a belief that dry gas demand coupled with lower production growth will stage a comeback in the longer term, leading to higher prices. The decline in drilling and storage is

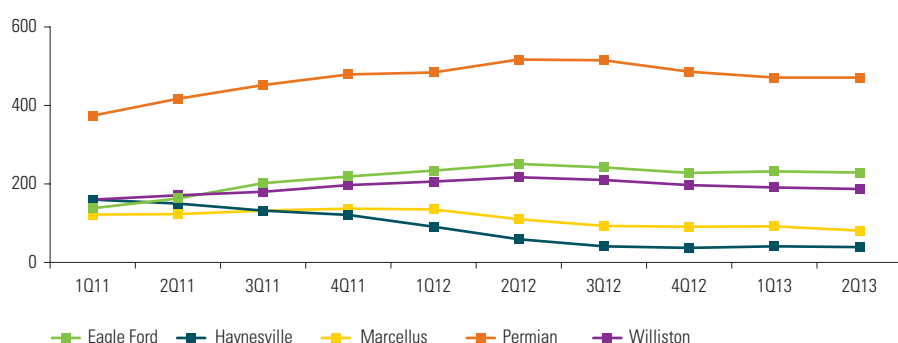
expected to drive some of this increase, stimulating the construction of gas utility plants and other key facilities, while potential increases in demand tied to the reindustrialization of the US is also likely to play a role. Conversely, the high price of developed liquid assets has led buyers to invest in undeveloped acreage, adopting a 'lease-

and-drill' strategy; pouring capital into management teams that are acquiring rights to drill and prospect.

Against this backdrop, infrastructure and midstream logistics continue to be overburdened as commodity production stretches the transportation, storage and refining capacities of an aging architecture. The subsequent transport and processing bottlenecks in the US have led to swings in differentials – some of them significant. Master Limited Partnerships (MLPs) have helped repurpose corporate balance sheets by dropping midstream assets into tax advantaged structures, freeing additional capital for other projects. MLPs have funneled private capital into the development of infrastructure such as compression stations, gathering networks, lines and storage terminals.

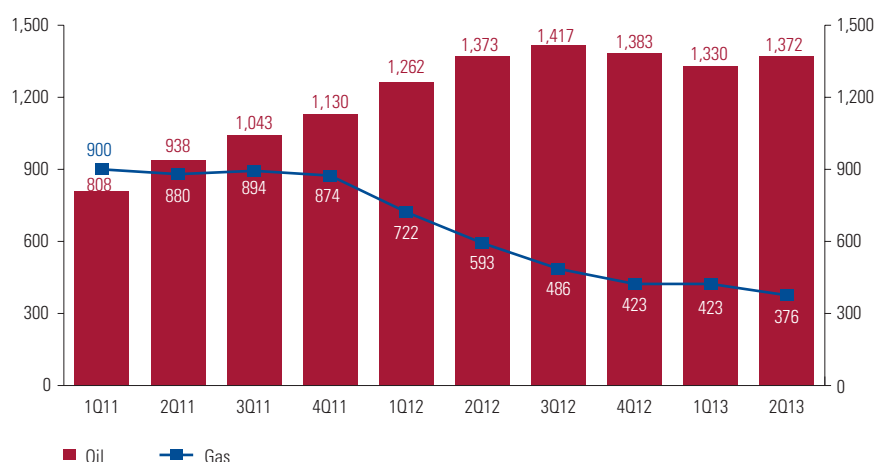
Although the required infrastructure will take decades to build, and gas prices may not recover for several years, there is no questioning shale's overall potential. In 2007, shale accounted for less than one-tenth of total gas production; by 2035³ it is forecasted to reach half of total gas production.

North American rig count by select named basins



Source: Baker Hughes

US land rig count by Oil vs. Gas



Source: Baker Hughes

Issues and opportunities

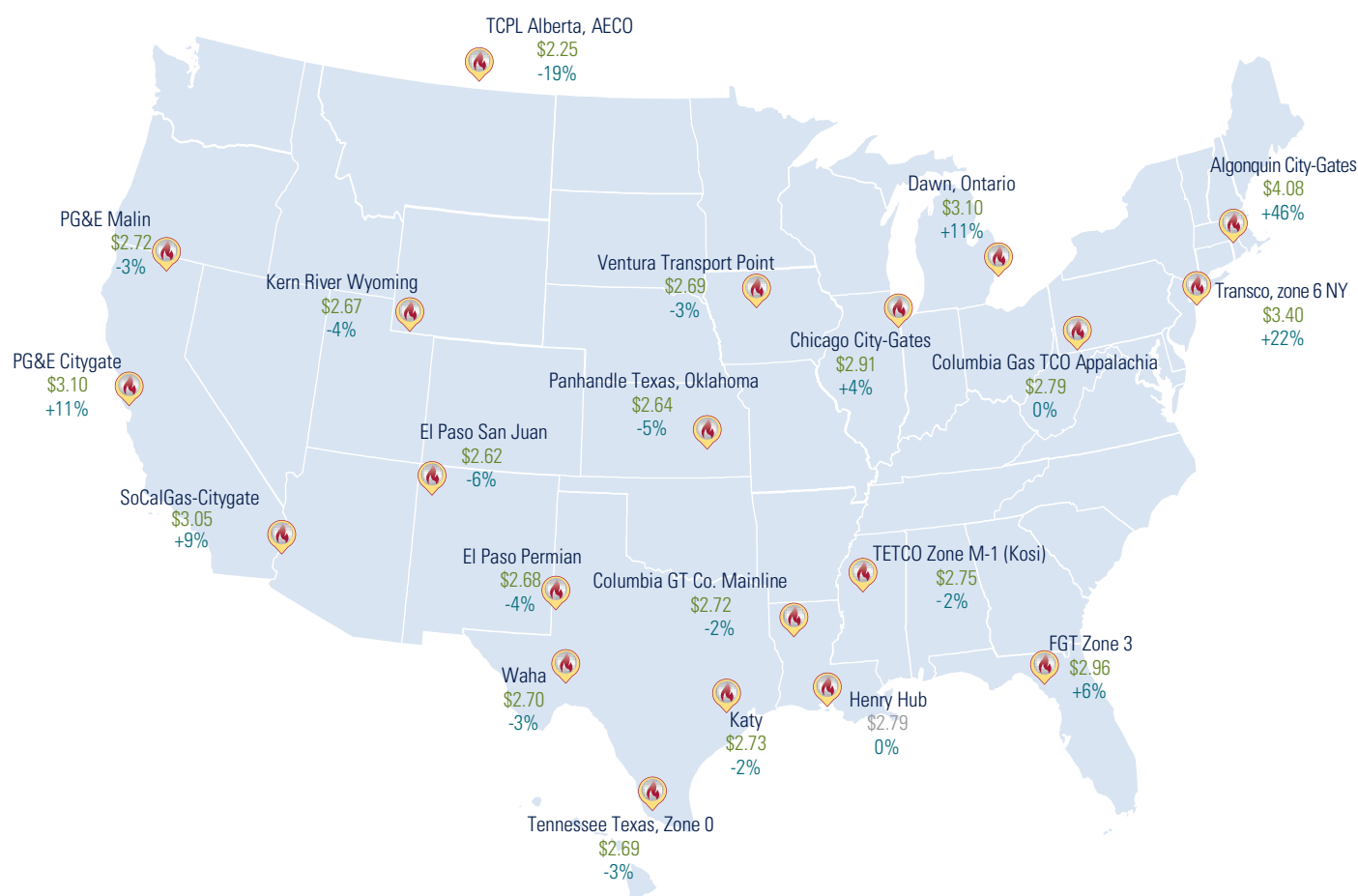
Reindustrialization of the US

The abundance of hydrocarbons in the US, along with competitively priced natural gas, has rejuvenated the outlook for the US industrial landscape, with the prospective creation of tens of billions of dollars' worth of capital investments in the gas-intensive manufacturing and chemicals sector and hundreds of thousands of new jobs.⁴ It has also sparked a political and economic debate over whether to: a) move forward with some of the pending Liquefied Natural Gas (LNG) projects, and export to Asian markets where prices are higher, or b) retain a global competitive advantage in the US by allocating gas supplies to help develop domestic

³ US Energy Information Administration, Annual Energy Outlook 2013, Market Trends, 15 April 2013, accessed via http://www.eia.gov/forecasts/aeo/MT_naturalgas.cfm

⁴ US Manufacturing and LNG Exports: Economic Contributions to the US Economy and Impacts on US Natural Gas Prices, Charles River Associates, 25 February 2013.

Major hub gas prices



2012 average price (\$/mmBtu)	Average differential from 2012 average Henry Hub price
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Source: Federal Energy Regulatory Commission (FERC)

chemical and industrial complexes. The former would create some upward lift on prices for energy producers and bring significant LNG construction opportunities in the US, while the latter would facilitate a continued recovery in domestic manufacturing by mitigating price pressure on natural gas and refined products.

Infrastructure

In certain regions of the US, there is a lack of pipelines, terminals and storage to hold and transport shale gas and oil to the customer base. Moving these

materials adds considerable costs, especially when using rail.

In order to fully exploit the potential of shale gas, it is estimated that, between 2011 and 2035, the sector needs US\$2 trillion in upstream investments for wet gas production, and US\$1.7 trillion for dry gas. An additional US\$205 billion capital spending would be required for gas infrastructure development, with mainline gas transmission expanded by about 35,600 miles and an additional 589 billion cubic feet (bcf) of working gas storage.⁵

LNG prospects

US LNG exports are forecasted to rise to around 0.18-0.24 billion cubic meters (bcm) or 6.5-8.5 billion cubic feet (bcf) by the end of the decade. A handful of US projects have a realistic chance of being built; Cheniere's Sabine Pass, Freeport LNG, Semptra's Cameron, Dominion's Cove Point and Southern Union's Lake Charles.⁶ A number of LNG facilities are awaiting permits, including terminals along the US coastline, where the Eastern Seaboard in particular has a solid infrastructure for export. As of June 2013,

⁵ *Historic opportunities from the shale gas revolution*, KKR report, Nov 2012

⁶ *US Manufacturing Renaissance, Is It a Masterpiece or a (Head) Fake?* Morgan Stanley Blue Paper, 29 April 2013.

of the three import terminals and 20 export terminals proposed to the Federal Energy Regulatory Commission (FERC), only two – Sabine, on the border between Texas and Louisiana and Freeport McMoran, in Texas – have been approved to export LNG to non-FTA countries. Sabine Pass' terminal is the only one actually under construction. At a recent congressional hearing, a DOE official told lawmakers that it took about two months to approve the most recent application. Although newly appointed Energy Secretary Ernest Moniz said he'll review the permit process before the next application, analysts took that to mean that new permits could start rolling out as fast as one every two months. Despite the slow progress of these approvals, and the aforementioned debate over whether to retain gas for domestic use, all the conditions appear to be in place for the US to become a major exporter, should it so desire.

Inconsistent environmental regulations

As the fracking debate rumbles on, fact-finding missions and studies abound at federal and state levels, with no sign of a consensus. A lack of consistency from state-to-state has led investors to shun certain states (such as New York) in favor of those that are more supportive of development (such as Texas, North Dakota, Pennsylvania and West Virginia).

Water management and availability

With West Texas suffering its worst drought in decades, accessing sufficient water to further develop the booming Permian basin is a big concern. Other regions are also struggling with securing this vital resource. Disposing of this water in an acceptable, environmentally friendly manner is an additional challenge, with basins using vast amounts in the fracking process. Permits for disposal wells are hard to come by in certain states, which once again highlights the inconsistency in regulatory regimes across the US.

Tax legislation

There is a continued lack of consensus in Washington regarding the repeal of federal tax benefits for those funding drilling costs; developers are monitoring such developments closely.

M&A trends

With dry gas prices remaining low, shale gas transactions (as a percentage of total upstream transaction value) have subsequently decreased from 38 percent in 2011 to just 6 percent in 2012.⁷ This has created a valuation gap, as current owners are increasingly unwilling to part with gas assets at depressed valuations, while buyers are steadfastly reluctant to offer more. As a result, operators and investors are devoting more time to developing existing reserves and improving production efficiency, while de-risking their asset exposure.

Tight oil/shale oil deals rose in 2012 from US\$15.5 billion to US\$20.3 billion.⁸ Of the major basins, Bakken and Permian

Basin are producing oil and the Eagle Ford output consists of oil and wet gas, while Barnett and Haynesville are mostly dry gas. Although the value of transactions in Bakken has risen slightly between 2011 and 2012 to US\$7 billion, the number of deals (32 vs. 42) has fallen. The Permian had just over US\$5 billion of transactions in 2012, which was a big leap from the previous year, despite the number of deals remaining steady at 17.⁹ Some of this activity includes private equity investment, which appears to be flowing into the purchase of undeveloped acreage as part of lease-and-build strategies, with a focus on liquids.

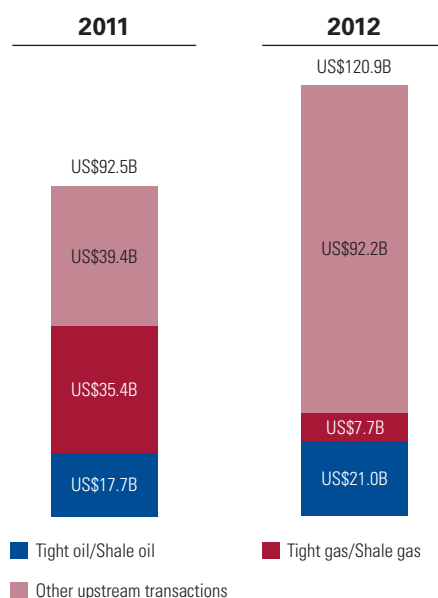
Despite the general shift in M&A towards liquids, some majors continue to increase exposure to shale gas through M&A and/or reserve development. For example, Exxon now gets about 50 percent of its production from, and has 50 percent of its reserves in, natural gas.¹⁰ In addition, utility providers are starting to buy into dry gas as an alternative to the spot market, entering into joint ventures with shale operators to secure their longer term supply base.

MLPs have become a popular and tax-efficient way to invest in the energy sector, with several players using this structure to exit, fully or in part, their upstream resources. Oil and gas producer Linn Energy announced in February 2013 that it was buying the drilling company Berry Petroleum Co., for approximately US\$2.5 billion, to gain more oil exposure and to broaden its presence in California, Texas and the Rockies.¹¹

New market entrants

Over the past five years or so, a number of foreign national oil companies (NOCs) have entered the market via joint ventures, with some of these investors now starting to take direct positions with exposure to resources. Requiring significant capital to develop

In the US oil and gas sector, shale-led transactions compared to total upstream transaction value



Source: IHS Herold, <http://www.ihs.com/products/herold/energy-transaction-research/index.aspx>

⁷ M&A, IHS Herold, 23 April 2013 accessed via <http://www.ihs.com/products/herold/energy-transaction-research/index.aspx>

⁸ Ibid.

⁹ Ibid.

¹⁰ Exxon's big bet on shale gas, Fortune, 30 April 2012.

¹¹ M&As And Investments Decreased In Oil & Gas Industry In Q1 2013, ASD Reports, 3 May 2013, accessed via https://www.asdreports.com/news.asp?pr_id=1425.



shale resources, Chesapeake sold a stake in an Oklahoma field to Sinopec (China Petrochemical Corporation) for US\$1.02 billion.¹² Chesapeake sold oil-rich shale fields in south Texas, as well as fields in Colorado and Wyoming, to the China National Offshore Oil Corporation (CNOOC).¹³

Nexen sold Canadian and US operations and assets to the CNOOC for US\$15 billion in what is China's largest-ever foreign investment.¹⁴ The NOCs are interested not just in the shale resource itself, but in the emerging shale exploration and production technologies, hoping to accelerate their learning to exploit China's domestic shale opportunities. In 2012, Sinopec purchased a shale oil and gas project from Devon Energy for US\$2.5 billion,¹⁵ while PetroChina Co. paid US\$1.2 billion to Encana Corp for shale acreages in Alberta.¹⁶

In early 2013, Sinochem entered into a US\$1.7 billion joint venture with Pioneer Natural Resources to acquire a stake in the Wolfcamp Shale basin in West Texas, providing access to oil shale.¹⁷

Japan's Sumitomo Corporation's US\$1.4 billion investment in Devon Energy in 2012 provides access to tight oil and shale oil in the Cline and Permian basins.¹⁸

Non-traditional players and the super majors are also getting in on the act. Freeport McMoRan's intended acquisition of Plains Exploration & Production Company for US\$9 billion¹⁹ reflects its strategy to diversify commodity exposure from mining to oil and gas, while an announced joint venture between steel giant Nucor and Encana Oil & Gas²⁰ aims to provide Nucor's manufacturing base with a reliable longer term shale gas supply from the Piceance basin in Colorado. Meanwhile, ConocoPhillips is active in three liquids-rich shale trends: Eagle Ford, Bakken and North Barnett. As a result of the vast shale opportunities available in North America, ConocoPhillips along with other oil majors such as Exxon are re-investing significant capital and focus in the US.

Outlook

Although depressed dry gas prices have slowed the development of new

shale exploration, there is continued enthusiasm for proven unconventional reserves. Should dry gas demand make a comeback, then those bold enough to continue investing in undeveloped acreage may be vindicated.

Longer term prospects for shale are undeniable, but the US will have to overcome weaknesses in its midstream infrastructure and, in some states at least, resolve ongoing questions over the environmental impact of fracking and water management.

LNG faces an uncertain future, with slow progress over approvals of terminals, and a continued debate over whether to export or retain gas to boost domestic reindustrialization. Nevertheless, the US has undoubted potential to export on a large scale.

The trend for foreign energy companies, non-traditional players, large independents and majors to invest in North American shale gas and oil looks set to continue, fueled by the US's industrial rejuvenation and the opportunity to tap into the existing technology and intellectual property.

¹² *Sinopec's US Shale Deal Struck at Two-Thirds' Discount*, Bloomberg, 26 Feb 2013.

¹³ *CNOOC adds to Chesapeake energy stake*, New York Times, 31 Jan 2011.

¹⁴ *CNOOC closes \$15.1 billion acquisition of Canada's Nexen*, Reuters, 25 Feb 2013.

¹⁵ *Sinopec enters US shale*, Wall Street Journal, 4 Jan 2012.

¹⁶ *PetroChina Pays \$1.2 Billion to Form Encana Joint Venture*, Bloomberg, 14 Dec 2012.

¹⁷ *Sinochem to buy 40% of Pioneer Natural Venture*, Wall Street Journal, 30 Jan 2013.

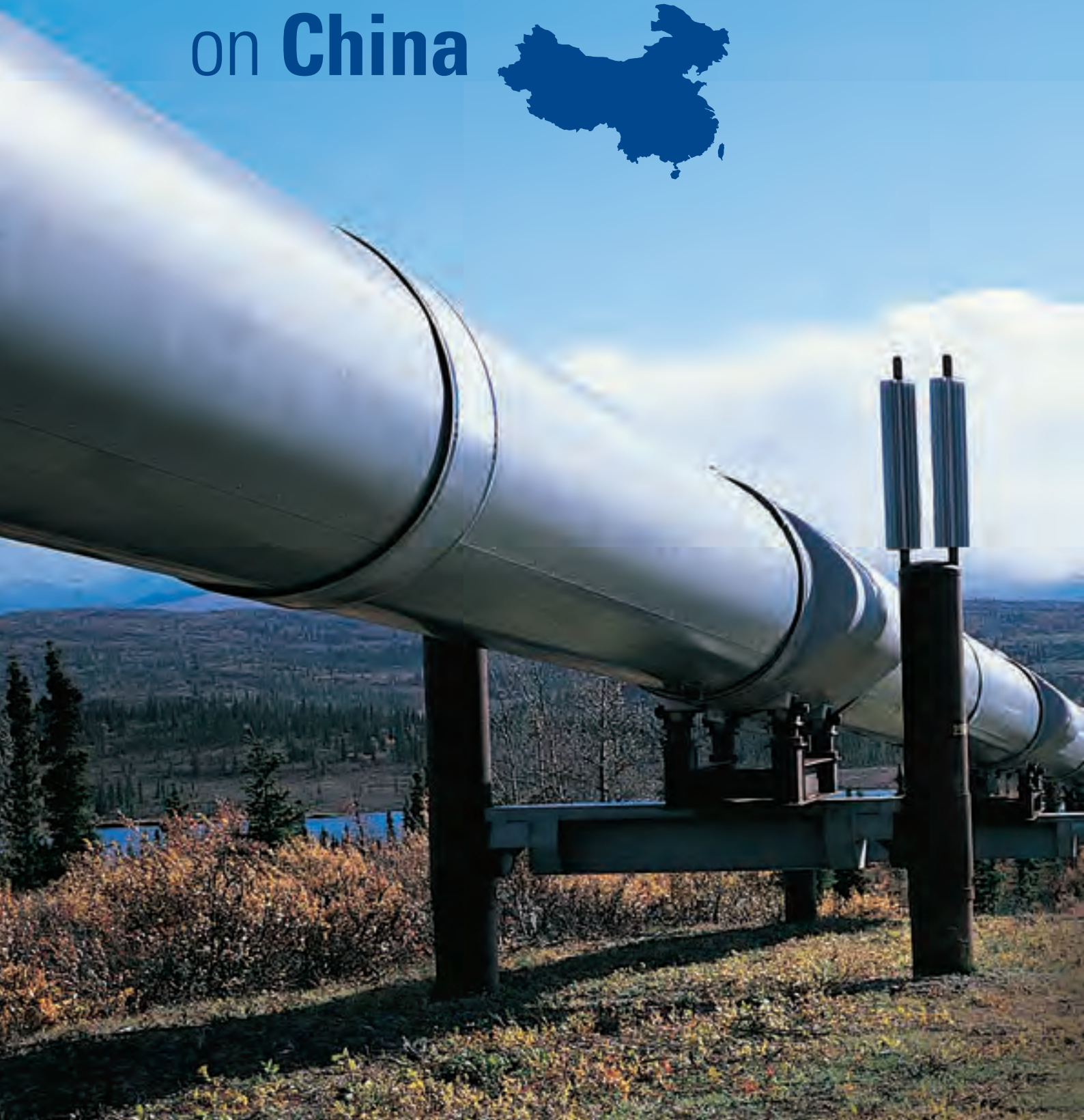
¹⁸ *Devon Energy, Sumitomo in \$1.4 billion deal*, Wall Street Journal, 2 Aug 2012.

¹⁹ *Freeport-McMoRan Copper & Gold Inc. to Acquire Plains Exploration & Production Company and McMoRan Exploration Co. in Transactions Totaling \$20 Billion, Creating a Premier US Based Natural Resource Company*, Business Wire, 5 Dec 2012.

²⁰ *EnCana, Nucor Ink Gas Drilling, Supply Agreement*, Rigzone, 6 Nov 2012.

FOCUS

on **China**



Opportunities

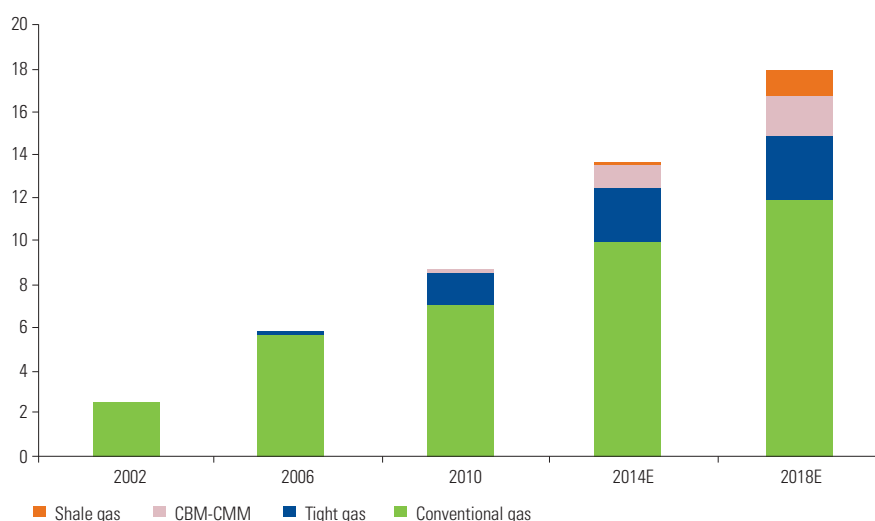
According to government figures, over 7 billion Chinese yuan (CNY) or US\$1.13 billion has been invested in exploring the country's shale prospects up to the end of 2012. Output to date is just 0.015bcm of shale gas, which pales against the official target of 6.5bcm per year by the end of 2015.²¹

Two of the main energy companies Sinopec and PetroChina alone are expected to reach 2bcm and 1.5bcm, respectively, by 2015.²² More drilling permits have been awarded in 2013, and hopes are pinned on the glut of

joint ventures with foreign partners, such as PetroChina's production-sharing contract with Shell that was approved in March 2013,²³ the first of its kind.

A shale gas subsidy of CNY11.25 (US\$1.8) per mmBtu is available for shale extracted up to 2015 – approximately 45 percent of the current Henry Hub price.²⁴ This is further evidence of the Chinese government's commitment to shale gas and oil, which are both considered to be 'encouraged foreign investment industries' within China limited to equity joint ventures and contractual joint ventures.

China domestic gas production – billion cubic feet per day (bcf/d) 2002–18



Source: "Unconventional Gas in China, Spring 2011", China Greentech Initiative, http://www.chinagoabroad.com/sites/default/files/v1_attachments/2012/04/CGTI2011-CCE-WS1-Unconventional-Gas.pdf, accessed 6 June 2013.

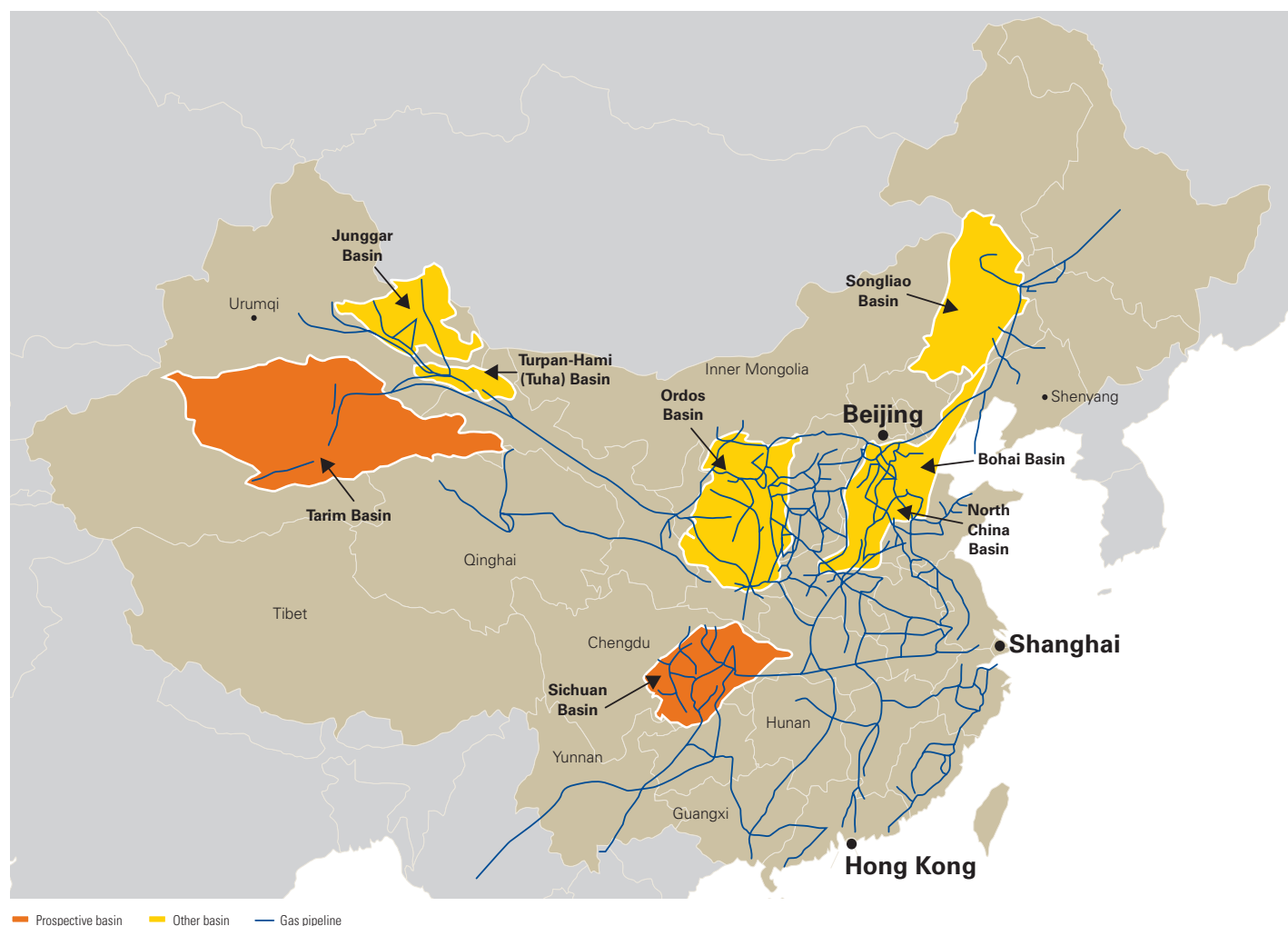
²¹ China's fledgling shale gas sector, Reuters, UK Focus, 29 March 2013.

²² Sinopec targets 2 bcm/y of shale gas output by 2015, Natural Gas Daily, 21 March 2012.

²³ Shell Plans to Spend \$1 Billion a Year on China Gas, Bloomberg, 28 March 2013.

²⁴ China Announces 2012-2015 Shale-Gas Subsidies to Boost Output, Bloomberg, 5 Nov 2012.

List of shale deposits, basins and their production in China



Analysts believe that commercially significant supplies of shale will not emerge from China until 2015.²⁵

Issues

Despite large reserves, China faces significant obstacles in recovering and commercializing shale gas and oil. Firstly, the country's severe water shortages may hinder an industry that is highly dependent upon very large volumes of water. The existing pipeline infrastructure is also insufficient to transport gas to the main centers of population, which are hundreds and in some cases thousands of miles from

the source. However, China's lack of fracking technology could prove to be the greatest hurdle to overcome.²⁶

M&A trends

A number of blocks of development land are only open to Chinese state-owned enterprises, with two blocks awarded in 2011 to Sinopec (in Nanchuan) and Henan CBM (in Xiushan). Second round bids opened up to Chinese independents and foreign companies in joint ventures with suitable local partners, with 152 bids received from 83 companies for 20 blocks, and in

January 2013, 16 firms were awarded exploration rights in 19 blocks.²⁷

Six of the successful firms are state-run and mostly affiliated with big utility and coal firms, including Huadian Group, Shenhua Coal Group and China Coal Group. Eight are new energy investment companies and two are private firms. With no experience in drilling for gas, it is likely that these businesses are looking to foreign partners to bring in essential expertise. The winners have collectively pledged to spend CNY12.5 billion (US\$2 billion) on developing the sites over three years.²⁸

²⁵ *China's Shale Gas Dream*, The Diplomat, 25 Jan 2013.

²⁶ *Shale Gas: China's Untapped Resource*, Forbes, 13 June, 2013)

²⁷ *China awards 19 blocks to 16 domestic companies in second shale gas bid round*, Platts, McGraw Hill Financial, 21 Jan 2013.

²⁸ Ibid.

International joint ventures and working agreements

Sinopec has joint assessment agreements with BP and ExxonMobil for technical evaluation, although no wells have yet been drilled due to the challenging terrain.²⁹ Chevron has drilled one well at the Longli block in Guizhou, but results were “not very good,” according to a Sinopec official.³⁰

In March 2013, Shell announced plans to spend CNY6.25 billion (US\$1 billion) on developing shale natural gas reserves in the 35,000 km² Fushun-Yongchuan block in the Sichuan basin, as part of its partnership with PetroChina.³¹

In another joint venture, Shell has signed a joint study agreement with the China National Offshore Oil Corporation (CNOOC), where the Anglo-Dutch giant will provide technical assistance for shale gas exploration.³²

Production progress to date

By the end of 2012, around 80 shale gas wells had already been drilled,

primarily by PetroChina, Sinopec, Yanchang Petroleum and Shell. Industry officials reported that one well drilled by Shell in the Fushun block tested a daily gas output of 60,000-130,000 cubic meters (m³).³³ China National Petroleum Corporation (CNPC), the country's largest oil and gas producer and supplier, has started building the country's first dedicated shale gas pipeline of over 90 kilometers (km) in the southwest Sichuan Province.

This will link gas wells in the Changning block to an existing gas line that leads to neighboring Yunnan Province, and will have the capacity to transport 4.5 million m³.

Looking overseas

In a bid to access fracking technology, Chinese companies have entered into at least CNY45.6 billion (US\$7.3 billion) worth of shale gas deals in the US.³⁴

Outlook

In the world rankings of technically recoverable shale reserves, China is placed third for shale oil (at 32 billion barrels) and a clear first for shale gas (31.6 tcm).³⁵ These impressive reserves, combined with soaring domestic demand, gives the Chinese shale market considerable potential, assuming it can overcome the burden of high extraction costs, gain access to sufficient supplies of water, and catch up with vital technologies. The growing investment by Chinese companies in the US is evidence of a thirst for acquiring essential fracking know-how. Government financial subsidies should help the drive towards commercialization, aided by the growing participation of US and European energy companies, via joint ventures. Improvements in infrastructure can only accelerate this trend.

²⁹ Sinopec Group Unit, Exxon Sign Agreement on Shale-Gas Area, Bloomberg, 18 July 2011.

³⁰ Chevron joins hunt for shale gas in China, Energy Interfax China, 24 Feb 2012, accessed via <http://www.interfax.cn/news/energy>

³¹ Shell plans to spend US\$1B on China shale gas development, Financial Post, Energy, 13 March 2013.

³² Shell, CNOOC to Explore for Oil Off China, Gabon, Wall Street Journal, 25 July 2012.

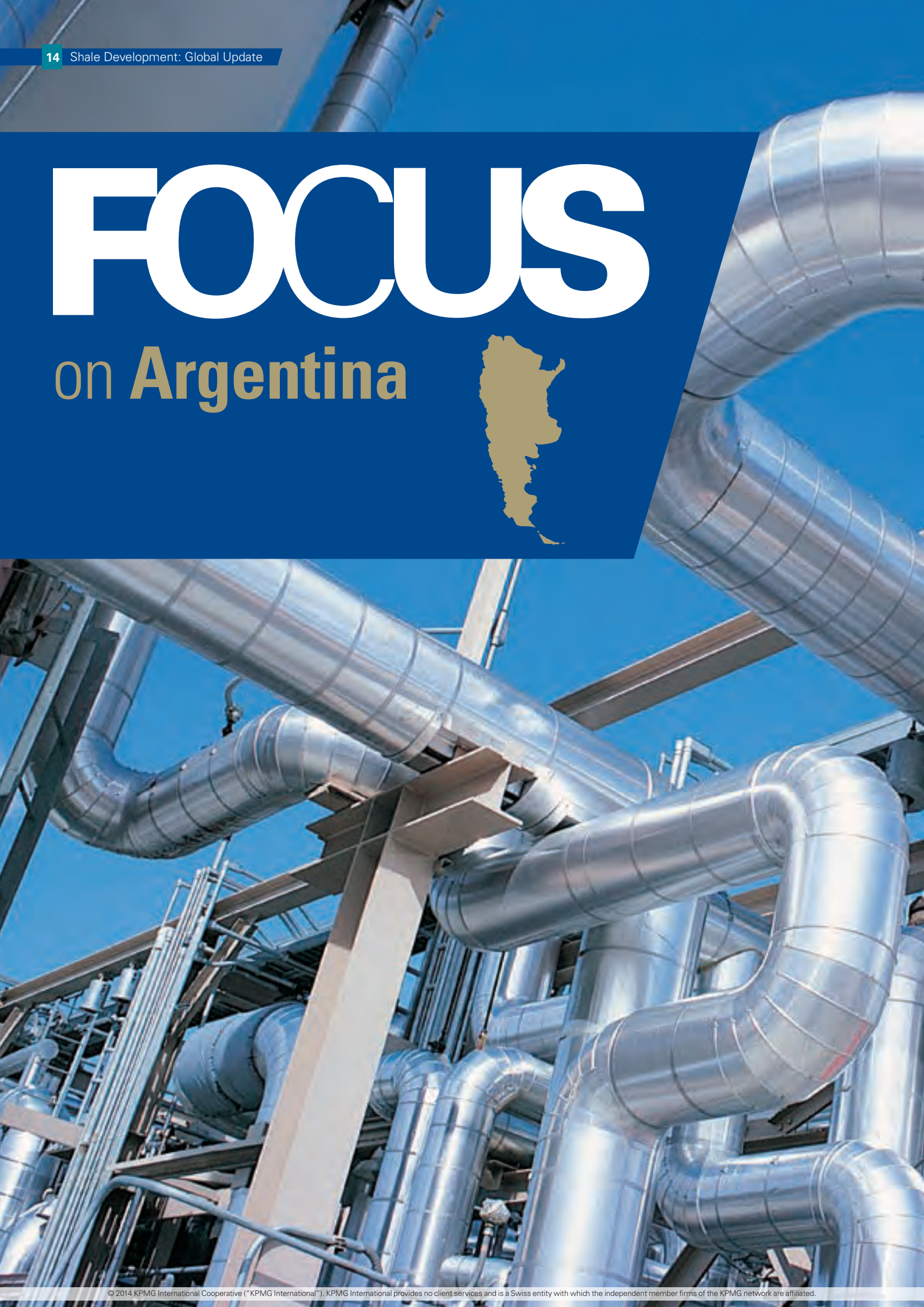
³³ UPDATE 1-Shell says China approves shale deal, plans more drilling, Reuters, 26 Mar 2013.

³⁴ Chinese shale gas still slow-going, Platts, 20 Dec 2012.

³⁵ Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States, U.S. Energy Information Administration, June, 2013.

FOCUS

on **Argentina**



Opportunities

Argentina has some of the world's biggest and best-quality reserves of shale hydrocarbons, with studies estimating recoverable shale gas and oil reserves of 22.7 trillion cubic meters (tcm) and 27 billion barrels, respectively.³⁶ Only China and the US have larger supplies. The 2012 discovery of shale gas in the Vaca Muerta formation in Argentina's Neuquén Province is further confirmation of the country's newfound promise of gas self-sufficiency.

Although foreign investors are naturally excited about the prospects in Argentina, they are sizing up the political and economic environment before committing significant funds, with concerns over a recession and possible resource nationalism.

Issues

In March 2013, Argentina's state-run energy company Yacimientos Petrolíferos Fiscales (YPF) took a major step towards exploiting Vaca Muerta by developing a connection to the main Pacific gas pipeline, with an initial investment thought to be between 130-200 billion pesos (ARS) or US\$25-40 billion.³⁷

Forecasts suggest that, even without shale gas, natural gas production will reach 40.5bcm by 2017, with imports expected to exceed 15bcm within the same time frame.³⁸

M&A trends

Shale gas projects in Argentina are following a similar pattern to other

regions, with a number of joint ventures involving YPF, with a letter of intent signed in late 2012 with Chevron for a pilot project in the Vaca Muerta. However, progress has been tentative, due to a court freeze of over ARS38 billion (US\$19 billion) worth of Chevron's assets in Argentina, in connection to environmental claims over its activities in Ecuador: a decision that was eventually revoked in June 2013.³⁹

In July 2013, a Madrid court ruled that it was competent to judge a case brought by Spanish oil group Repsol against the previous year's expropriation of its subsidiary in Argentina. Repsol is seeking about ARS75 billion (US\$13.5 billion), having already rejected an ARS28 billion (US\$5 billion) non-cash proposal that included both companies becoming partners in a shale joint venture.⁴⁰

Earlier, in March 2013, YPF and Dow Argentina signed a Memorandum of Understanding for the joint development of the first deposits of shale gas in the El Orejano block of the Vaca Muerta.⁴¹

Outlook

Regulatory and technical issues aside, large-scale commercialization of shale appears inevitable, given Argentina's huge reserves, excellent geology and strong oil and gas industry.

³⁶ Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States EIA/ARI Advanced Resources International, Energy Information Administration (EIA), 10 June 2013.

³⁷ *Ámbito Energético*, accessed on 22 April 2013.

³⁸ Argentina Oil and Gas Report Q2 2013, Business Monitor International, 17 April 2013.

³⁹ *Chevron Argentina Asset Freeze Revoked Easing Shale Venture*, Bloomberg, 5 June 2013.

⁴⁰ *Repsol secures Spanish court case over YPF expropriation*, Financial Times, 11 July, 2013.

⁴¹ *Argentina's YPF, Dow Chemical could team up on shale gas*, Reuters, 26 March 2013.

FOCUS

on Australia



Opportunities

Australia is estimated to hold the world's seventh-largest reserves of shale gas⁴², but compared to countries such as the US, exploration and development has been limited and relatively low-key over the past decade. This 'sleeping giant' is on the brink of change, with a series of deals and announcements signaling rapidly gathering momentum.

Australian government agencies have estimated Australia's technically recoverable shale gas resources at almost 11 tcm (400tcf).⁴³ Reserves exist in most mainland states, with exploration targeting shale gas generally taking place in inland basins. Among those regarded as having greatest commercial potential are the Cooper Basin, which extends from South Australia into Queensland over an area of 130,000km²; and the 470,000km² square kilometer Canning Basin extending inland from the north-west coast of the continent.

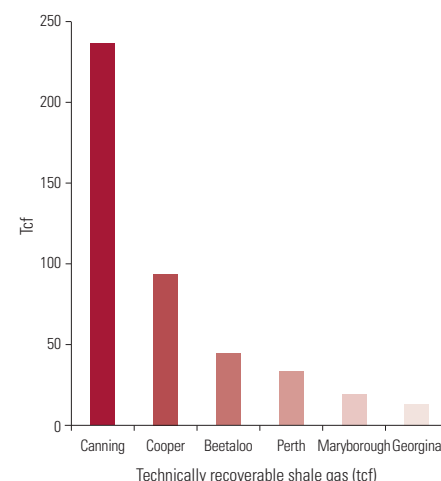
Development is in its infancy, with Australia's first shale gas well – operated by Santos in the Cooper Basin – coming online in October 2012. Although a small step in terms of volumes, this is a big milestone: the scope for production from this and other fields is enormous.

Unlike the US, where shale gas is often close to populated areas and farmland, most of Australia's shale deposits are in largely remote locations. This limits the risk around issues that have plagued shale gas development elsewhere.

Australian shale gas has the potential to play roles in both domestic and export markets. Gas currently comprises about 15 percent of Australia's electricity generation, but the Australian federal government's 2012 Energy White Paper suggests it is likely to make up an increasing proportion of the domestic energy mix in the transition away from coal to cleaner energy sources. Shale gas has the potential to play an important role in the domestic gas market by replacing conventional and coal seam gas earmarked for sale overseas. However, Australia's low population – currently 23 million – means that if an especially large reserve were to be commercialized, it would likely be for LNG and export.

Australian east coast gas markets are increasingly intersecting with international markets, with LNG contracts already being written at international prices; predictions for future prices vary. Domestic pricing is widely forecast to rise in the medium term

Technically recoverable shale gas in Australia (tcf)



Source: "Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States," EIA, <http://www.eia.gov/analysis/studies/worldshalegas/pdf/fullreport.pdf?zscb=82939045>, accessed 27 June 2013.

⁴² Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States EIA/ARI Advanced Resources International, Energy Information Administration (EIA), 10 June 2013.

⁴³ Geoscience Australia and BREE, 2012, Australian Gas Resource Assessment 2012, Canberra, p3, accessed via http://www.ga.gov.au/webtemp/image_cache/GA21116.pdf



and stimulate gas production, although projected increases in international supply may complicate the dynamic.

Geographically, Australia is well positioned to provide shale gas to rapidly industrializing and urbanizing South-East Asian economies such as Malaysia and Vietnam, as well as to established customers in Japan, China and South Korea. Japan – with which Australia has strong, long-term trade relationships – is stepping up demand for gas as it reviews its nuclear program.

Issues

Australia is a high-cost country in which to develop and operate. Australian resources projects can cost 40 percent more to deliver than on the US Gulf Coast.⁴⁴ Australian wages are high by global standards, nowhere more so than in the resources sector. Although rising costs have been on an upward trend for some time, opinion is widely held that this is not sustainable and that Australia will begin to see a downward trend in project costs overall. For several years the

pool of skilled labor has not been large enough to meet demand in mining and energy; remuneration rates have soared. With the quest for expertise taking place on a world scale, it is likely that at least some experienced shale gas labor and talent – as well as technology – will need to be sourced from the US.

The depth and relative isolation of most Australian shale deposits poses a disadvantage in terms of drilling costs and available infrastructure. Many locations are remote from utilities, transport and social infrastructure, adding significantly to project and operational costs; the Cooper Basin is exceptional among Australian shale regions in having significant existing gas infrastructure. Gas, once extracted, must travel long distances to reach markets. Compliance costs are high: obtaining permissions to access a site can be complex and time-consuming because of the range of state and federal requirements.

Although there remains some uncertainty around carbon and resources taxation policy, in the

global context Australia rates well for stable government, sound regulatory frameworks and high levels of transparency. Securing financing is not expected to be problematic for Australian shale gas provided offtake contracts are in place.

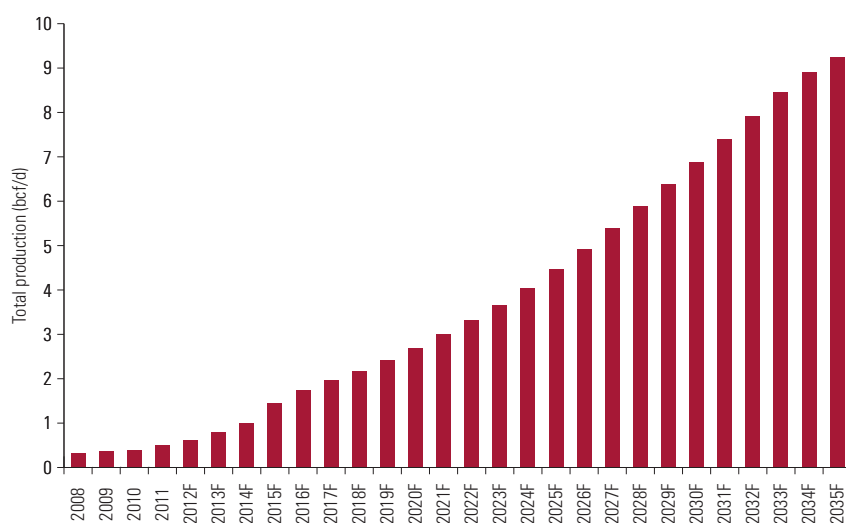
M&A trends

A series of announcements over the past year by major international players make it clear that shale gas in Australia is no longer dormant. Much of the activity has centered on major national and international companies entering into joint ventures with smaller explorers.

In June 2012, Norway's giant Statoil announced that it was farming in to exploration in the Northern Territory's Georgina Basin with a phased US\$210 million investment with PetroFrontier.⁴⁵

Soon afterwards, in November last year, the Western Australian government approved a 25-year agreement for Buru Energy and its joint partner Mitsubishi to explore for gas and build a pipeline in

Shale gas, tight gas and CBM production in Australia/New Zealand from 2008–35



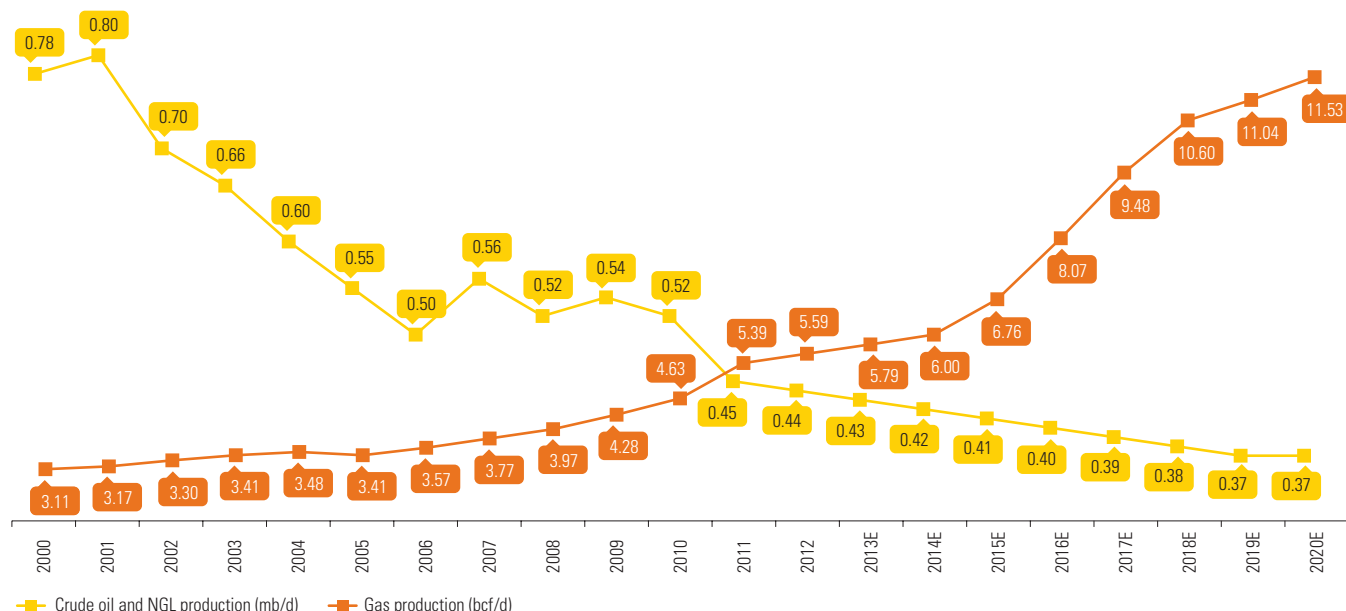
Source: International Energy Outlook 2011, EIA

Note: CBM – Coal Bed Methane

⁴⁴ *Pipeline or Pipe Dream? Securing Australia's Investment Future*, Business Council of Australia, June 2012.

⁴⁵ *Statoil enters shale exploration in Australia*, 20 June 2012, accessed via http://www.statoil.com/en/NewsAndMedia/News/2012/Pages/20Jun_Australia.aspx

Total production of oil and natural gas in Australia from 2000–20



Source: EIU database accessed on 3 June 2013

the Canning Basin. If commercially viable gas resources are discovered by 2016, the partners – which have the option of extending for a further 25 years – will be required to submit a plan for construction of a domestic gas project to be connected to the Pilbara gas network.⁴⁶

US oil major ConocoPhillips is partnered with New Standard Energy in the Canning Basin. In February 2013, ConocoPhillips stated that PetroChina would buy 29 percent of the onshore Goldwyer shale formation in the Canning Basin; the move is reportedly part of China's strategy to double the share of gas in its energy mix to more than 8 percent by 2015.⁴⁷

Perhaps most significantly, in late February 2013, US-based Chevron agreed to pay up to US\$349 million

for a stake in Beach Energy's Cooper Basin interests. It was Chevron's first investment in Australian shale, and the single biggest acquisition by any company in Australian shale.⁴⁸

Beach Energy has been active in the Cooper Basin for several years and is continuing to drill for shale gas. Santos is another important player in Australian shale gas; it began its Cooper Basin unconventional gas program in 2004, operates Australia's first network-connected shale gas well and has announced further drilling.⁴⁹

Outlook

Australia has the potential to become a major player in shale gas on an international scale. Although there

are hurdles to be overcome, mainland Australia's vast reserves in relatively unpopulated areas offer significant opportunities. In the domestic market, shale gas can replace conventional and coal seam gas being shipped offshore. Additionally, as an experienced net exporter of energy, Australia is uniquely positioned to exercise existing relationships in Asia to increase exports to long-standing and new buyers of LNG. It is too early to speculate about when Australian shale gas will become commercially viable on a massive scale, but the marked increase in activity over the past year by major, well-resourced, international entities suggests the push is under way.

⁴⁶ *Buru gets nod for Canning Basin gas*, The West Australian, 7 November 2012, accessed via <http://au.news.yahoo.com/thewest/a/-/breaking/15322051/buru-gets-nod-for-canning-basin-gas/>

⁴⁷ *ConocoPhillips to sell Australian gas assets to PetroChina*, Reuters, 20 February 2013, accessed via <http://www.reuters.com/article/2013/02/20/conocophillips-westernaustralia-idUSL4N0BK5NT20130220>

⁴⁸ *Shale gas: tap into new wealth*, AFR Smart Investor, 13 March 2013, accessed via http://www.afrsmartinvestor.com/p/magazine/shale_gas_tap_into_new_wealth_w7REI0kCrgCftBANU2tpuO

⁴⁹ Ibid.

FOCUS

on **Indonesia**



Opportunities

Having once been self-sufficient in energy, Indonesia has seen its oil output fall to around 830,000 barrels a day, nearly half the levels seen in the 1990s. Its gas output dropped to about 0.232bcm (8.2bcf) a day in 2012, down about 12 percent from 2010.⁵⁰ Although gas is poised to take up a larger share of the country's future energy consumption, long term contractual commitments to supply Singapore, Korea, Taiwan, Japan and other overseas customers will continue to absorb a significant portion of domestic gas production. The rapidly rising gap between supply and domestic demand means that the world's third-largest exporter of LNG has no option but to import LNG cargo in the short to medium-term, while it ramps up investment in the development of gas reserves to increase the levels of domestic production.⁵¹

Asian buyers currently pay more for LNG than those in Europe and North America, which means a strategy of acquiring LNG will not be cheap. Over the last decades, Asia has linked the price of LNG to crude oil, which proved beneficial until rising oil prices left buyers paying far more for LNG than those in the west. Asian purchasers would now much prefer LNG prices to be tied to a natural gas index. Furthermore, Indonesia continues to honor a number of long-term commitments to supply LNG to Asian countries at contract prices well below current market rates.

In a bid to overcome shortfalls in future supply and shore up its energy security,

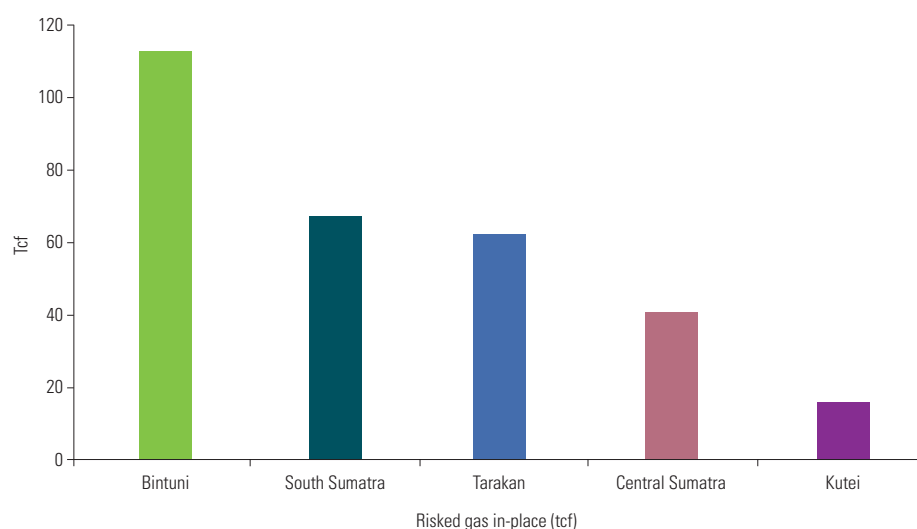
in May 2013, the Indonesian government announced tenders for 21 oil and gas exploration blocks. Four of these are for unconventional gas concessions on the islands of Kalimantan (Borneo) and Sumatra and consist of two shale gas blocks and two coal bed methane blocks.⁵² A government study suggests that Indonesia has shale gas reserves of around 16tcm (574tcf),⁵³ making it potentially one of the world's largest shale markets.

State oil and gas company, Pertamina has signed a 30-year contract on Indonesia's first shale gas concession in the Sumbagut block in North Sumatra. The block is estimated to hold 525bcm (18.6tcf) of reserves and would require as much as US\$8 billion in development costs. Canada's Talisman Energy is one of the specialist companies expected to deploy its technical expertise and capability to assist Pertamina with the exploration, appraisal and development

process.⁵⁴ Talisman has a long history of investment in Indonesia, as well as relevant project experience in the Eagle Ford and Marcellus shale gas plants in the US. Major international players such as Chevron Pacific Indonesia, ConocoPhillips, ExxonMobil, as well as several Canadian and Australian oil companies, have also expressed interest in developing Indonesia's shale gas potential.⁵⁵

Hydraulic fracturing technology is expected to play a big role in the development of shale gas. Traditionally, unconventional sources of gas were not considered economically viable due to the high development and extraction costs, but this technology has already had a significant impact on reducing the cost of extraction. Its application in the development of challenging basins has seen natural gas prices in the US fall to around US\$2-4 per mmBtu compared to US\$9-10 in Europe and US\$13-18 in Asia.

Shale gas potential in Indonesia (tcf)



Source: "Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States," EIA, <http://www.eia.gov/analysis/studies/worldshalegas/pdf/fullreport.pdf?zscb=82939045>, accessed 27 June 2013.

⁵⁰ *Indonesia offers 21 oil and gas blocks in tender*, Reuters, 17 May 2013.

⁵¹ *Pertamina to import LNG to meet rising gas demand in local market*, The Jakarta Post, 25 June 2012.

⁵² *Indonesia to Import LNG by 2018 as Demand Rises*, Migas Says, Bloomberg, 6 March 2013.

⁵³ Ibid.

⁵⁴ *Indonesia Explores Shale Gas Opportunities*, Rigzone, 28 May 2013.

⁵⁵ Ibid.

Issues

Indonesia's oil and gas industry is controlled by the regulator SKKMigas (until recently known as BPMigas). Political changes have left investors feeling considerably less confident about the regulatory environment, but companies do continue to show interest in investing in the development of the country's shale gas. Operating and development costs are recoverable under the terms of the Productions Sharing Contracts (PSC), but shale gas developers are obliged to sell 25 percent of proven reserves to service Indonesia's domestic demand. There are currently few incentives linked to the development of shale gas, and a lack of clarity over exploitation rights in cases where site boundaries conflict with those of established conventional oil and gas upstream operators.

The nature of Indonesia's geography creates further challenges for gas distribution, with demand from many remote areas spread across the country's network of islands, which typically lack the infrastructure necessary to receive gas. A number of plans are in place to address these limitations. Pertamina has converted the existing LNG plant into a receiving and regasification terminal, while Pertamina and Perusahaan Gas Negara (PGN) – the largest gas transmission and distribution company in Indonesia – have ongoing floating storage regasification unit (FSRU) projects that will process LNG imports intended for domestic consumption. In a further effort to reach the country's dispersed pockets of demand, plans are in place to create a number of 'mini' LNG terminals to distribute the gas. These initiatives are designed to meet industrial demand for electricity with gas, which is cheaper than diesel and more environmentally

friendly⁵⁶ than both diesel and coal fueled power stations.

The cost of developing LNG infrastructure is substantial, involving liquefaction plants, storage facilities, special tankers and regasification terminals.⁵⁷ If these costs are compounded further by inflated prices for LNG cargoes that will feed into the gas system, then the proposition becomes less attractive – particularly when cheaper and more widely available coal currently supplies the majority of the country's energy needs. Indonesia can exploit existing technology to develop its domestic gas reserves at economical rates. Such development investments would reduce the price of domestic gas production, enabling the country to maintain a leading position as an LNG exporter, at attractive sales prices, while also servicing a larger proportion of national demand.



⁵⁶ *Mini-LNG for East Indonesia*, Jakarta Globe, 20 April 2013.

⁵⁷ *Asian LNG buyers push back on high prices*, Arcticgas.gov, 28 Sept 2012.

M&A trends

The Indonesian government takes a majority shareholding in any gas block, with a foreign operator assigned to offer technical assistance and operate the gas block, receiving a minority stake. To date there have been no shale mergers or acquisitions; although long-established, integrated oil and gas companies such as Chevron and BP might be expected to take an interest should opportunities arise in the future. Such incumbents could consider integrating the development of shale gas into existing oil and gas infrastructure, depending on the block's proximity to their existing assets.

The Tangguh conventional gas field, located in West Papua province, is a typical example of a joint venture, led by BP and also involving China's CNOOC and Japan's Mitsubishi, Sumitomo and Kanematsu Corporations. This consortium supplies LNG to customers in China, Korea and the US.

Outlook

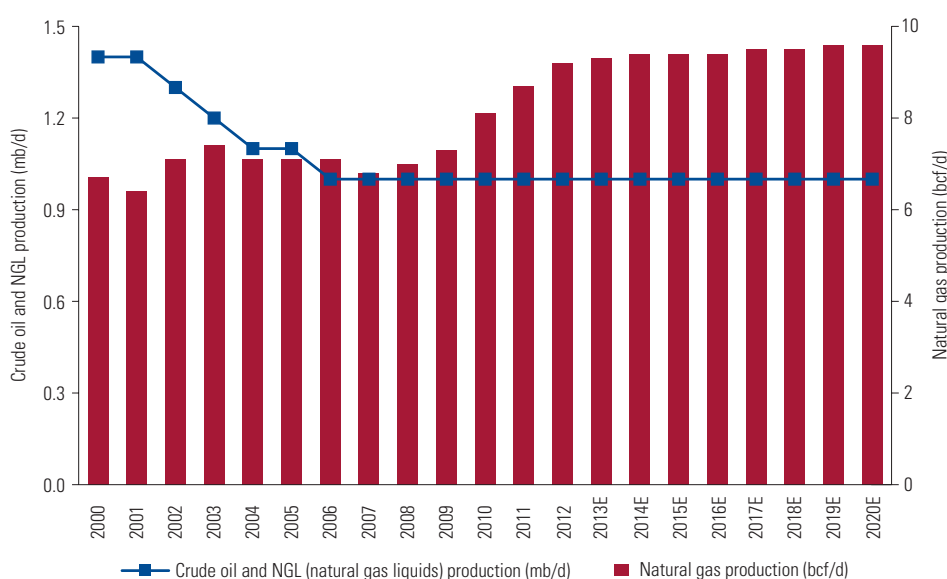
Although Indonesia continues to invest in unconventional blocks to boost future domestic production levels, shale gas development is still at an early stage and the country will need to import gas for the next 5-10 years. However, with Asian markets potentially gaining access to greater volumes of cheap gas exports from the US, Australia and Africa in the coming years, large scale investment in Indonesian shale exploration may carry a degree of risk. In response, Indonesia's government has chosen to secure future energy needs by investing in infrastructure that increases its capacity to regasify, store and distribute imported LNG cargo. Looking further ahead, it has complemented these short to mid-term plans by funding the exploration and development of gas from unconventional sources, which it possesses in abundance.

If Indonesia can overcome environmental concerns and exploit new technology to produce gas at relatively low prices,

then over time it could reduce its dependence on costly LNG imports and still meet domestic demand. Ultimately, the future price of LNG will determine whether the nation's expanding LNG infrastructure should also be utilized for export purposes. Alternatively, if Asian LNG spot prices/futures come down, then Indonesia may want to curtail future investment in the development of shale gas and increase LNG imports to cater for domestic gas consumption using established LNG facilities.⁵⁸

Gas will undoubtedly be taking a more prominent share of Indonesia's future energy mix. However, investors still question the transparency of the regulatory framework and the associated operational requirements they are expected to work within. If these conditions remain favorable and are applied consistently across the production cycle, then there is every reason to be optimistic about the potential of the country's shale gas development.

Total production of oil and natural gas in Indonesia from 2000–20 (estimation)



Source: EIU database accessed on 3 June 2013

⁵⁸ Should Natural Gas Prices in Europe and Asia Be De-Linked From Oil? Minyanville.com, 12 March 2013.

FOCUS

on the United Kingdom



Opportunities

Like many countries, the UK sees home-produced natural gas as an opportunity to decrease its reliance upon foreign sources of energy. In his 2013 annual budget speech, British Finance Minister George Osborne said “shale gas is part of the future and we will make it happen”, as he unveiled measures to support the new industry, including gas field allowances to promote early investment in the sector and tax breaks for fracking companies.⁵⁹

Taxes paid by energy firms operating in the UK’s offshore oil fields would be linked to prospective onshore shale-gas drilling. The proposed changes include a new field allowance for shale gas and an extension of the ring-fence expenditure supplement. Companies operating in the UK’s offshore oil and gas sector would get immediate relief for shale-development costs at a 62 percent rate set against their production in the North Sea, while the field allowance would reduce tax rate on profits from shale gas production from 62 percent to 30 percent.⁶⁰

Gas is central to Britain’s latest power-generation strategy, with plans to build up to 40 new gas-fired power stations in the UK.

Although there is currently no shale gas production in the UK, a recent study by the British Geological Survey suggests there could be as much as 40tcm of shale gas in the north of England alone, making it the biggest shale basin in the world.⁶¹ (This compares to conventional gas resources of just 1,500bcm.⁶²)

If these figures are accurate, and the resources prove to be economically recoverable, the UK could become self-sufficient in gas for decades.

Such a large figure provides investors, operators and regulators with an indication of where to target future exploratory drilling, to determine the extent of gas that can be technically and commercially recovered.

However, a recent nine-month inquiry by industry and academic experts has concluded it is too early to estimate the volume of shale gas contained in UK rocks and harder still to know how much will be commercially viable to extract. The report by the Carbon Connect group⁶³ also stated that any boom in shale gas production would be “unlikely to give the UK cheap gas,”⁶⁴ as the gas would probably be exported to other European countries desperate for new sources.

Companies that have been granted a Petroleum Exploration and Development License (PEDL) by the UK government are permitted to explore and develop shale gas, as well as other types of petroleum resources. Of the estimated 334 onshore PEDLs, several dozen are thought to have shale potential.

Issues

Compared to countries such as the US and China, the UK is very densely populated, so drilling inevitably takes place in relative proximity to urban areas, which has raised public fears over water contamination and earthquakes, making it difficult for developers to secure planning permission to extract the gas. On top of this, there is concern that shale gas operations may leak methane and use considerable amounts of energy.

The government imposed an 18-month moratorium after initial fracking triggered tremors, but has since concluded that the environmental risks of shale exploration are small and manageable, with drilling allowed to resume in December 2012, albeit with stricter monitoring controls.⁶⁵

⁵⁹ *Fracking ‘unlikely to give UK cheap gas’, report says*, Independent, 22 April 2013.

⁶⁰ *U.K. Sets Tax Breaks to Encourage Shale-Gas Exploration*, Wall Street Journal, 20 March 2013.

⁶¹ The Carboniferous Bowland Shale gas study: geology and resource estimation, British Geological Survey for Department of Energy and Climate Change, Dec 2013.

⁶² Department of Energy and Climate Change oil and gas reserves, 2011, accessed via <http://www.gov.uk/oil-and-gas-uk-oil-portal>

⁶³ Future Electricity Series, Carbon Connect, 2013.

⁶⁴ *Fracking ‘unlikely to give UK cheap gas’, report says*, Independent, 22 April 2013.

⁶⁵ Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States EIA/ARI Advanced Resources International, Energy Information Administration (EIA), 10 June 2013.



Greater clarity over regulation is expected in 2013. With the UK government owning the mineral rights beneath the surface, in July 2013, industry trade body the United Kingdom Onshore Operators Group (UKOOG) committed to provide compensation for communities affected by shale gas operations; where fracking is required, operators must provide one-hundred million pounds (£) or US\$150,000 per well in community benefits at exploration phase, as well as sharing 1 percent of revenues.⁶⁶

A further barrier is the lack of gas pipelines and infrastructure, with the majority of the UK's current gas reserves offshore in the North Sea. The future of gas in general could also be influenced by cheap coal imports from the US, which has caused an increased proportion of coal-generated electricity in the UK.

M&A trends

Cuadrilla Resources, a small independent partly (43 percent) owned by Australian drilling company AJ Lucas, and led by former BP CEO Lord John Browne, is the main company actively

exploring UK shale, along with IGas Energy. Both are focused upon the Bowland shale – the only active shale drilling region in the UK.⁶⁷

In a major step forward for shale exploration in the UK, in May 2013, British company Centrica plc acquired a 25 percent stake in Cuadrilla Resources' Bowland exploration license for £40 million or US\$60 million. It will also pay exploration and appraisal costs of up to £60 million (US\$90 million), with a further contingent payment of £60 million (US\$90 million) if Centrica reaches development phase. Production may commence as early as 2017, depending on the emergence of planning guidelines.⁶⁸ The involvement of a heavyweight player like Centrica is evidence of the growing interest in shale – particularly in the Bowland Shale.

Coastal Oil and Gas Ltd., Celtique Energie, Dart Energy and Eden Energy also are evaluating their UK shale resource potential but haven't yet drilled.⁶⁹

The UK market is still in its very early stages, with commercial returns as

much as a decade away, and many investors are playing a game of 'wait and see', while also hoping for some government funding to kick-start the sector.

Outlook

Estimates of economic reserves vary widely, and the true volume of extractable gas should become clearer, once a significant number of wells have been drilled and gas flow rates tested, to establish shale's commercial viability.

Although the UK is unlikely to enjoy a shale gas boom on the scale of the US, with the right government support and investment, and local community compensation, shale could play a key role in the UK's energy mix in the long term, and give the nation greater security over its gas supplies – and potentially lower prices.

However, if the UK is to meet the government's goals and extract shale gas on a commercially viable basis, the sector needs to overcome regulatory and market barriers and manage negative public views on exploration.

⁶⁶ Investing in Britain's future, Her Majesty's Treasury report, June 2013.

⁶⁷ Ibid.

⁶⁸ *Shale gas 'key to lowering household energy bills' after Centrica invests £160 million into fracking*, Daily Mail, 14 June 2013.

⁶⁹ Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States EIA/ARI Advanced Resources International, Energy Information Administration (EIA), 10 June 2013.

Conclusion

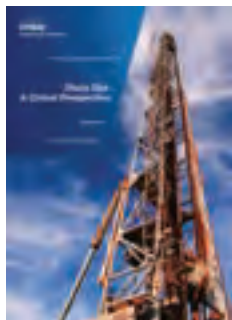
With a pronounced shift in the US shale market from gas to liquids, it is uncertain when gas prices will rise sufficiently to justify a return to large-scale dry gas extraction. Although the presence of majors such as ConocoPhillips and Exxon indicates confidence in the potential of shale, investors are hoping for a boost in infrastructure development and a favorable tax and regulatory environment to maintain momentum.

China is undeniably an up-and-coming player and, with strong government backing, is likely to have a strong influence on global markets within the next five years, and should continue to prove attractive to overseas investors. The future for Argentina is rather less clear cut, and may be dependent upon a more transparent approach to ownership, to reassure business owners. Having enjoyed a natural resources boom over the past two decades, Australia is well-positioned to take advantage of its shale reserves, assuming it can extract gas and liquids cost-effectively.

The continued impact of shale dry gas upon global prices will in part be determined by the degree to which it is exported as LNG; some governments may choose to put pressure on their energy industries to retain this critical resource to provide much-needed self-sufficiency as is the case in Indonesia. This factor, along with the speed of recovery of the US industry, may have a significant impact upon the return on investments in dry shale gas.



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