

Global Perspective

March 2014

There have been substantial changes to energy markets in recent years, some of which could significantly influence the development and shape of the global economy. We conclude that in all forms of energy, from hydro-carbons to renewables, regional markets continue to be more important than international or global ones, so the optimal energy mix will vary from country to country.

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Energy Assessment

There have been substantial changes to energy markets in recent years, some which could significantly influence the development and shape of the global economy. This article considers the evidence around international pricing, the supply of and demand for energy, and what this may mean for the future.

Short of crystal ball gazing in a field where prices are notoriously difficult to predict, topics include the sustainability of price differentials between regional markets. Also, the cost curves for various energy sources are evolving. The roles of, and balance between, emerging and developed economies matter more for both supply and demand of energy as the proportion of global GDP spent on fossil fuels rises. The national oil companies (NOCs) of major emerging markets have joined the traditional OPEC players as key suppliers and investors.

Elsewhere, shale has grabbed many of the headlines recently with claims of the shale gas boom leading an industrial renaissance in North America. Economic impact assessments suggest that the effects in the US, so far, have been modest both at county and national levels. There are reservations about whether, and on what time scale, shale becomes a global phenomenon. More broadly, the ascendancy of natural gas remains an important theme, as its share in the global energy mix has risen from 15% to 25% in the past four decades (chart 1). Finally, we address how the renewables race is shaping up.

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Divide and conquer

The effective separation of regional energy markets persists. This is partly due to disparate pricing models and partly to differing costs. In Asia and, to a lesser extent, Europe, trading of long-term gas contracts at prices linked to oil is the norm. Meanwhile, in the US the bulk of natural gas trading is done at spot and future prices set at Henry Hub. Other factors that aid and abet regional separation are infrastructure and transportation costs. Regulations also play a part – US federal laws, for instance, have prohibited the export of crude oil since 1975.

There are signs of change. In Europe, national markets for power were replaced by coupled markets from late November 2013, which should allow prices in 15 national markets to (gradually) converge to regional levels. Coupled markets make use of physical power links or interconnectors and have harmonised trading rules, which facilitates the cross-border trade of available power capacity. In time, Europe definitely and Asia probably will move away from oil indexation and towards hub pricing for gas. However, this does not mean that the gap with US prices will close to any great extent. At the same time, developments in the Middle East may result in more convergence between oil and gas prices as gas production shifts to higher-cost unconventional sources.

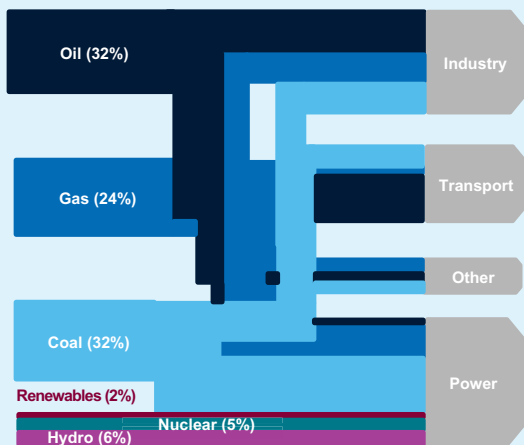
Shipping liquefied natural gas (LNG) requires significant transport and infrastructure commitment in the form of import/export terminals, pipelines and suitable carriers; transport and liquefaction costs for gas remain high at circa \$4.5-\$5.5 per mmBtu and up to a quarter of the energy is lost in the freezing, transport and regasification process. Also, if Henry Hub prices were to rise substantially or permanently, US exports of LNG would be threatened.

As far as oil exports are concerned, the US seems to be softening its stance a little on restrictions that date back to the oil crisis of the mid-1970s. In addition to two-way trade with Canada, permits have been granted for limited re-exports of foreign crude oil to Europe and there is a potential workaround using swap deals that allows US-produced crude to leave the country. Trade in energy is not always about supply and demand; energy security and geopolitical alliances are also considerations. If, for instance, oil from Saudi Arabia were re-exported, this would undermine Saudi Arabia's ability to apply discretionary pricing.

Increased US gas production has had little effect on European energy prices. So far, cheap gas in the US is displacing domestic coal consumption. US coal is then exported to Europe where it competes with relatively expensive gas in power generation. Events in the Ukraine have added urgency to energy security concerns relating to Russian gas supply – around a fifth of Europe's gas supply originates in Russia and passes through the Ukraine. However, even before the added political uncertainty, incoming US coal put pressure on Gazprom as well as Statoil (Norway), QP (Qatar) and Sonatrach (Algeria) as the main suppliers of gas to Europe, as contracts matured and could be renegotiated.

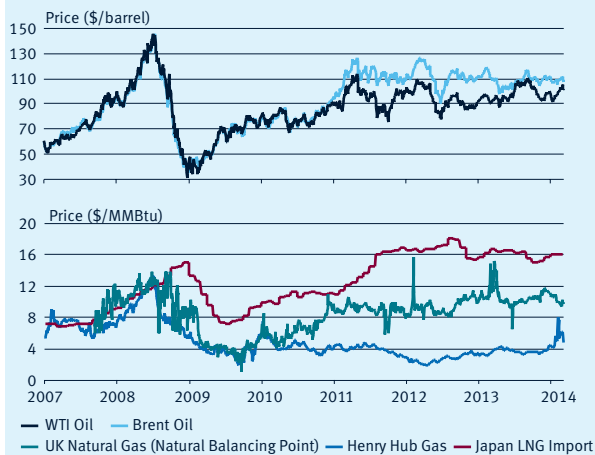
North American gas prices are still significantly cheaper than those elsewhere in the OECD, although contrasting weather drivers – polar storms over the US and mild weather in Europe, have resulted in short-term convergence between the US and Europe, while Asian prices remain high. In 2013, US Henry Hub gas contracts traded at less than half of comparable Europe prices, while oil prices (WTI and Brent) have converged somewhat, as shown in chart 2.

Chart 1
Primary energy sources and uses



Source: Citi Research, BP Statistical Review of World Energy (as of October 2013)

Chart 2
Oil converges, gas diverges



Source: Bloomberg, Datastream (as of 7 March 2014)

Cheap at the price

Cost curves for different energy sources have evolved over time. The integrated energy cost curve for power generation (chart 3) shows the gas curve extending from the lowest quartile to the third quartile, with only some solar power appearing to be more costly than the more expensive gas generation.

In oil, the convention is to discuss breakeven costs, although these include fiscal or budgetary elements as well as production costs. Chart 4 shows estimated breakeven projections for various oil producers. The fiscal breakeven price is the estimated oil price at which an oil-exporting country's budget is balanced. The calculation includes projections of non-oil fiscal receipts and investment income generated by sovereign wealth funds as well as income from petroleum taxes and royalties on the revenue side set against the fiscal deficit projection. Conventional producers have the advantage in extraction cost terms, followed by tight oil and deep-water fields, then heavy oil associated with tar sands.

For the oil-exporting Gulf States, costs have been rising as they have sought to diversify their own energy mixes. Several, including Kuwait and the UAE, have become net importers of natural gas, while others, such as Saudi Arabia and Oman, have curtailed exports of gas and are investing heavily in developing alternative and more expensive sources, including nuclear, to satisfy domestic energy requirements.

Global energy efficiency, crudely measured as dollar of GDP generated per dollar spent on fossil fuels, is down by around 2% since its peak in 2008. This has occurred despite the influx of 'cheap' shale resources and the fact that primary energy consumption has fallen in both the US and Europe since 2007, where efficiency has risen, perhaps as a consequence of austerity. The pattern is consistent with energy-intensive production being outsourced to emerging markets over the period. It also fits with a switch to lower density forms of energy (coal rather than oil). If the proportion of higher cost renewables in the energy mix rises, energy efficiency falls further.

Industrial renaissance

Shale gas and associated tight oil extraction has become viable with the development and refinement of hydraulic fracturing techniques. US gas production increased by 30%

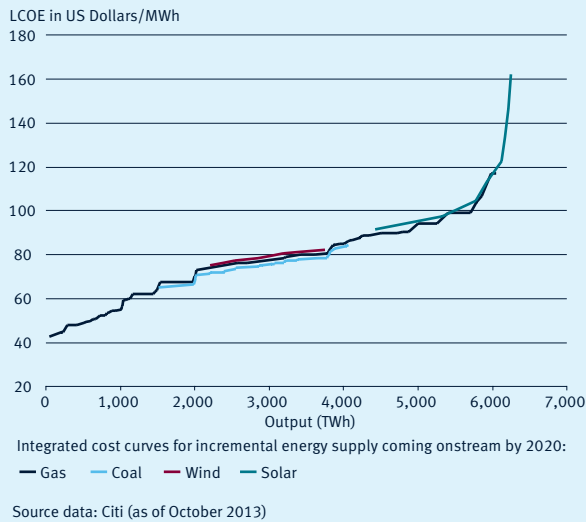
between 2002 and 2012 with shale gas making up 40% of domestic production by 2012. However, recent growth has been more subdued. Tight oil is expected to account for half of global oil supply growth to 2030 when it will represent around 9% of global supply. Early forecasts and analysis relating to the economic impact of and prospects for these unconventional 'fracked' resources have proven optimistic in terms of magnitude and timing. Re-industrialisation of the US is complex and challenging, and so far theoretical. A detailed analysis of the impact by county by the Kansas Fed concluded that shale extraction has afforded only modest benefits.

According to early analysis of US Department of Labor and company reports, employment and investment has grown in the energy sector, particularly extraction. However, the energy sector is relatively small, representing just 1% of employment and 1.6% of value added in the economy. In terms of GDP growth, the contribution of the oil and gas sector has been marginally positive; Goldman Sachs' estimate is around two-tenths of 1% in 2013 and an average of one-tenth of a percent of GDP in the decade. This is better than the marginal negative contribution in prior years, but hardly indicative of a game changer. The spillover of employment growth and capital investment into energy intensive sectors, chemicals, metal manufacturing, plastic and rubber products, is not outpacing the broader economy so far, which should be expected if there is to be an industrial renaissance.

The prospect of re-industrialisation may be slow to materialise, given a tempered business cycle, the overhang of caution on capital expenditure commitments in the wake of the financial crisis and the current skillset of the US labour force. In the case of chemicals, an energy intensive industry which uses (cheap) gas as a feedstock in the US and (more expensive) oil-derived naphtha in Europe and Asia, then the US and possibly Mexico should be natural choices for production location. The benefits would accrue locally and regionally rather than globally.

There are adverse implications for some emerging markets as the energy advantage to the US is more pronounced at the commodity rather than high value-added end. Any shift in production and investment, and subsequent reorientation of the US economy, would represent a headwind for the emerging economies that had taken on the role of outsourced energy-intensive bulk manufacturers based on their cheaper labour costs. That, in turn, increases the imperative

Chart 3
What energy costs



for emerging economies to move up swiftly in terms of sophistication and value-added products as their wages rise.

It remains to be seen whether the optimistic longer-term estimates of employment growth related to unconventional resources are borne out – McKinsey forecasts 1.7 million by 2020 and IHS forecasts 2.4 million by 2035.

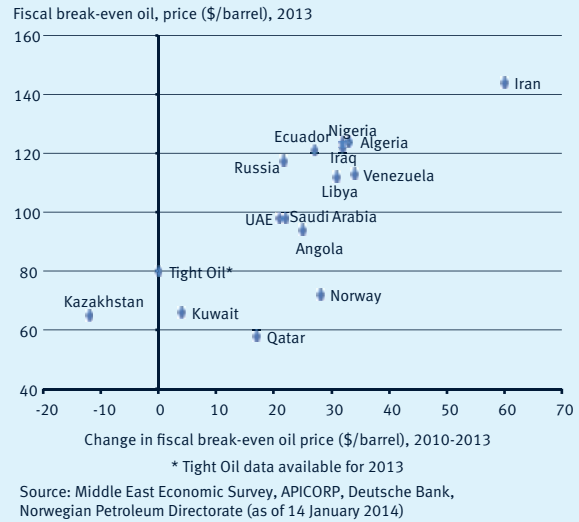
Open to oil?

Estimates of where and how much shale gas/tight oil there is have increased, but outside North America progress towards even test drilling has been slow. The majority of commentators think 2020 would be the earliest production outside North America could come on stream. This suggests that, to the extent that unconventional energy resources are an enduring part of the future and market dynamics persist, North America will retain its advantage for a decade or more.

In North America the extraction technology is now familiar and working well. Drilling efficiency has risen and service costs have fallen. There are contrasting views on gas prices. Canadian exploration and production companies say returns on shale gas alone are positive even at Henry Hub prices of around \$3.70 per mmBtu (other estimates put the breakeven price at around \$4.20). Views depend on the resource mix; where it is combined with tight oil, shale gas appears as a by-product, which brings down the breakeven price. In contrast, Exxon has argued that recent Henry Hub prices are below replacement cost for LNG; the energy giant expects the price to rise fourfold for delivery into Asia, as petroleum liquid-rich plays are exhausted. Because of the pattern of extraction – high volume at the outset and then tailing off quite rapidly – shale appears to be the natural choice for the swing supply for gas in the US.

Countries exploring for shale will face higher costs as they build out the necessary infrastructure and establish new wells. Also, in most countries, the ownership of mineral and extraction rights is less straightforward than in North America, which will delay exploitation. Concerns over the environmental impacts remain, particularly in densely populated countries such as the UK. Apart from objections ranging from methane leakage to some of the chemical additives and seismic disturbance, extracting shale carries significant costs in terms of both water and energy which may influence the decision whether or not to proceed. Where there are long-term commitments to other energy sources,

Chart 4
Broad based breakeven breakdown



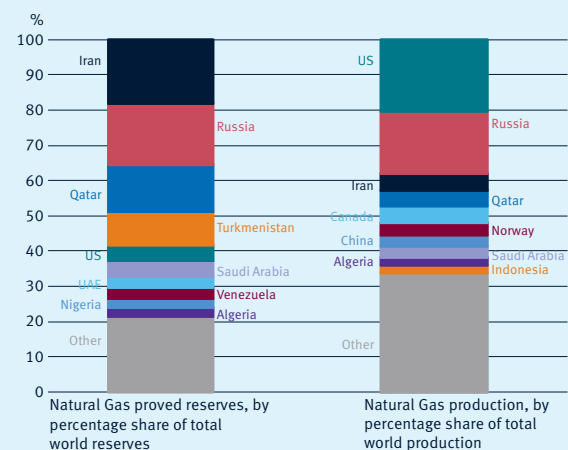
for example nuclear in France, a change in direction towards shale in the near term is unlikely. If projects in the UK and Poland succeed, in other words are profitable as well as effectively diversifying supply, other European countries may follow.

Potential future entrants to the unconventional energy field include Argentina (Vaca Muerta with an estimated 23 billion barrels of oil), Saudi Arabia, Australia, South Africa and North Africa (Silurian shale), although Algeria seems disinclined to extract at this point. Russia has substantial reserves, for example Bazhenov shale in Siberia where Exxon Mobil and Rosneft are to drill, and the tax regime is generally supportive. However, the country also has a choice of energy resources it can exploit and it is not clear that shale would be top of the list in terms of extraction costs and infrastructure requirements. Russia's current focus seems to be competing with Qatar and Australia in seaborne LNG. The UK is test drilling for shale gas and coal bed methane – GDF Suez, Centrica, Cuadrilla Resources, AJ Lucas (Australian private equity) are involved in onshore activity. China has not seen any real shale investment yet – water availability is likely to be a limiting factor and comments from firms involved in energy joint ventures there suggest that shale would be challenging to exploit.

We can conclude that a global market based on shale gas and tight oil is unlikely. The roll out in other countries will take time, and transport and storage remain issues. If we extend the analysis to other forms of gas, regional markets are still more likely than truly international ones and the optimal energy mix will vary considerably country by country. Before shale, it was LNG that fired the enthusiasm of investors. In recent years, substantial investment in LNG infrastructure for transport, export and import had been put in place, for example in the US, Australia and the UK. Some US regasification terminals have been re-engineered to become export terminals. LNG investment in Australia and elsewhere has been partly in response to Japan's increased requirement for gas in the wake of its natural and nuclear disasters.

Although shale gas has boosted the US to fifth position in the ranking of proven recoverable gas reserve holders, it is third in terms of LNG production (chart 5). The EU, and particularly the UK, have seen reserves fall in the last ten years as production has outstripped identification of new recoverable reserves. Private sector companies seeking to monetise resources explain the more rapid exploitation of reserves in

Chart 5
The gas giants



Source: BP Statistical Review of World Energy 2013

the US and Australia compared with countries where national energy companies dominate. The US reserves to production ratio is 12 years compared to over 55 years for the other leading reserve holders.

Renewables

While our analysis so far has concentrated on gas, which is evolving more quickly than other energy forms and is growing as a proportion of the energy mix, renewables should not be overlooked as another area of change in the global energy complex. Renewable generation has also grown rapidly enough to keep pace with rising energy consumption. Also, while renewable energy may be only 2% of power output, it accounts for 40% of the \$9.7 trillion recently invested in power generation. If all ‘clean’ and renewable energy is counted together, hydro and nuclear as well as wind, solar and bioenergy, output is 13% and investment share around 70%.

Continuing investment suggests that renewable energy has the potential to increase its footprint. For parts of Europe and Asia, where the natural endowment of fossil fuels is more meagre or has already been spent, a focus on energy efficiency and diversifying supply via renewables makes sense. In China, where pollution is a major and rising concern, renewables are part of the solution and will continue to attract investment. In hydro-carbon rich areas, however, where gas and coal prices are low, renewables remain uncompetitive without subsidies. Again, there will not be global agreement on what is an appropriate outcome, which is unhelpful to the climate change lobby. Incidentally, as far as a green agenda is concerned, natural gas may be better than coal in terms of carbon dioxide, but the methane it comprises is a much more potent heat-trapping, greenhouse gas than CO₂.

The cost of commitment to renewables can be seen in chart 6. This shows that households in particular are paying more for energy where political leaders bought in to particular items on the renewables agenda, for example wind in Denmark and solar photovoltaic in Germany. The significant subsidies for consumers/generators, and support for manufacturers in countries like China, applied to these technologies have decreased, spurred on by changing policy priorities such

Chart 6
The price of being green

	Electricity costs (US Dollars per MWh)		Energy of Choice
	Industry	Households	
Denmark	104.26	383.43	Wind
France	103.89	194.87	Nuclear
Germany	148.71	338.75	Solar
Japan	194.27	276.76	Anti-nuclear
Norway	57.56	135.98	Hydropower
Sweden	89.19	223.96	Hydropower
UK	134.17	220.74	Gas
USA	66.98	118.83	Coal

Source: IEA (as of 2013)

as fiscal austerity. However, they were enough to reduce installed costs to some extent; wind now sits in the middle of the energy cost curve though solar still looks expensive. If costs fall further, there could be more voluntary adoption of renewables but the overall generation share is probably still capped by considerations such as storage and ensuring uninterrupted energy supply.

Conclusion

The energy industry is evolving. Alongside the development of conventional, albeit increasingly expensive deep sea oil and gas fields, for example in Kazakhstan, fracked resources such as shale gas and progress in renewable technology are starting to make their mark.

The US is now self-sufficient in gas, but it is still importing oil. Optimistic projections are that it could be self-sufficient in oil as well as early as 2020. That would be a game changer. While we think that shale gas may not directly provide more than a slight fillip to GDP, the change through the traded sector – an improving balance of payments – could have a significant impact on the currency, which then would be reinforced if the US did undergo some form of industrial renaissance. This would be a positive contribution to addressing global imbalances.

Our analysis suggests that in all forms of energy, from hydrocarbons to renewables, regional convergence of pricing is more likely than international or global convergence. Consumption is forecast to grow rapidly in non-OECD regions, including Asia Pacific and MENA, while North America and Africa have strong production growth potential. Hence, the optimal energy mix will vary considerably from country to country, as production costs and drivers are very different.

Energy efficiency is declining, a headwind to the global economy. This is despite the effects of the shale gas and tight oil ‘revolution’, which we see as more modest than commentators generally claim. Estimates of the potential industrial and employment impact are not proven. Future developments that would favour shale and LNG include a shift to gas as a transport fuel, especially for trucks, and a step up in regulatory approval of exports from the US to Central America or Europe.

House View

The following asset allocation is based upon a global investor with access to all the major asset classes. For regional versions of the House View, please contact your Standard Life Investments representative.

March 2014 House View		
Risk	The Global Investment Group emphasises moderate levels of risk, focusing on assets either with sustainable yield or those able to provide sustainable earnings expansion in a moderate growth environment.	NEUTRAL
Government Bonds		
US Treasuries	Economic data and QE tapering are slowly bringing forward market expectations for interest rates to rise, although the Fed will act to prevent a rapid upward movement in yields.	LIGHT
European Bonds	A moderate economic recovery with very low inflation provides support for bond yields, while peripheral spreads can tighten further as investors look for yield opportunities.	HEAVY
UK Gilts	The asset class is increasingly vulnerable to the pick-up in economic growth, and valuations are expensive. Manageable inflation pressures and central bank guidance can anchor rising bond yields.	LIGHT
Japanese Bonds	The inflation outlook is deteriorating as the government aims for reflation, although the Bank of Japan bond-buying programme should prevent yields rising too significantly.	LIGHT
Global Inflation-Linked Debt	Inflationary conditions are subdued in many developed economies, although valuations in individual countries require careful examination; investor worries remain about future inflation triggered by easy monetary policies.	NEUTRAL
Global Emerging Market Debt	Dollar-denominated bonds are Heavy as spreads show better value, while local currency bonds are Neutral as careful examination is required of individual currency and spread factors.	HEAVY/NEUTRAL
Corporate Bonds		
Investment Grade	Attractions such as positive corporate cash flows are increasingly priced in, while upward pressures from government bond markets will periodically affect total returns.	NEUTRAL
High-Yield Debt	Although spreads have come in moderately, the outlook for bond defaults remains supportive. Yields are still relatively attractive in certain sectors as long as the outlook for corporate earnings remains positive.	NEUTRAL
Equities		
US Equities	The underlying fundamentals in terms of consumer spending, housing and business confidence are improving, offset by such headwinds as fiscal tightening and higher borrowing costs.	HEAVY
European Equities	Valuations are supportive and corporate competitiveness improving, but fiscal programmes and structural reforms remain constraints while the ECB has not managed to improve credit availability in many sectors.	NEUTRAL
Japanese Equities	Monetary policy is increasingly priced in and structural reforms are not being aggressively pursued. Corporate earnings are benefiting from a more competitive currency.	NEUTRAL
UK Equities	The improvement in both the domestic economy and overseas order books is feeding through into stronger earnings growth for a wider range of companies, and valuations appear relatively attractive.	HEAVY
Developed Asian Equities	Slower commodity demand from key economies such as China affects some countries but currency flexibility is beginning to help rebalancing across key sectors.	NEUTRAL
Emerging Market Equities	Performance is increasingly divergent; while some countries benefit from strong domestic fundamentals, others are under pressure from politics, current account deficits and tighter monetary policy required to stabilise depreciating exchange rates.	NEUTRAL
Real Estate		
UK	The improving growth environment is expected to bolster prices in the near term and yields remain attractive compared to other assets, suggesting returns well ahead of cash over a three-year holding period.	HEAVY
Europe	In line with the economic improvement in peripheral Europe, the gap in real estate performance between core and southern European real estate markets is narrowing.	NEUTRAL
North America	While pricing and development is peaking in the Canadian market, the best regional opportunities lie in smaller US cities with a strong growth outlook. US supply is increasing in some submarkets but development is generally constrained.	HEAVY
Asia Pacific	Yields have found a floor and recovering rents are driving pricing, further fuelling investor activity. Japan remains ahead in the cycle.	NEUTRAL
Other Assets		
Foreign Exchange	The US dollar will benefit from the slow tightening of monetary policy, while a weaker euro and yen will eventually support their economies.	VERY HEAVY \$, NEUTRAL £, LIGHT €, LIGHT ¥
Global Commodities	Different drivers, such as a rise in the US dollar, Chinese demand, Middle East tensions, and climatic conditions, influence the outlook for different commodities.	NEUTRAL
Cash		
	While some central banks have pledged to keep rates lower for longer, others are beginning to tighten monetary policy, especially in emerging markets.	NEUTRAL

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