Energy in 2014 – After a Calm Comes the Storm

By Spencer Dale and Alexander Naumov*

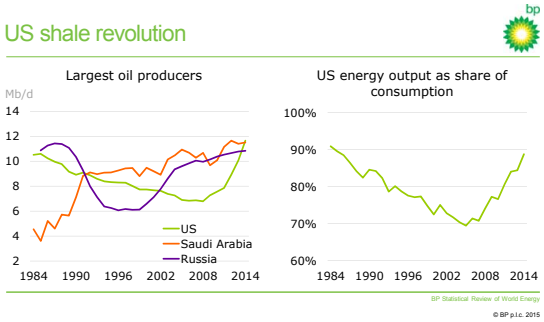
Introduction

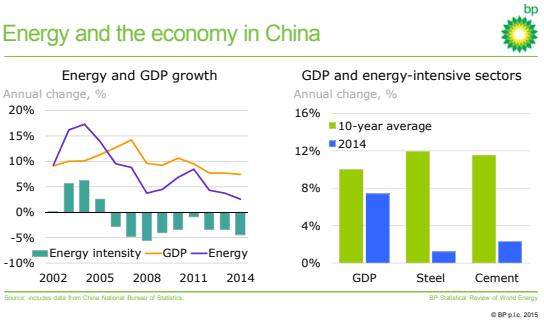
For several years global energy markets have been characterized by what can be described as eerily calm conditions. The turbulent and unsettled events of last year provided a stark reminder that, in energy, after a calm comes the storm: uncertainty and volatility are the norm rather than the exception. The global energy system is huge and moves only slowly, but it does move. In 2014, it moved in earnest driven by some of the longer term forces which are likely to shape the energy landscape over coming years. This paper reviews developments in global energy markets in 2014 based on the 2015 edition of BP Statistical Review of World Energy.

As ever, there were many factors, specific to particular markets and fuels, that contributed to the energy story of 2014. But there were also several broader, more encompassing forces, acting across fuels and geographical borders. Three factors in particular were instrumental in shaping movements in global energy markets in 2014: the ongoing shale revolution in the U.S.; structural economic transition in China, and the continued focus on climate and environmental issues. Consider these three factors in turn, starting with the U.S. shale.

In recent years the U.S. shale industry has gone from strength to strength profoundly changing the global energy supply picture. At its height last year, more than 1800 rigs were operating in the major U.S. oil and gas plays, drilling around 40,000 new wells. Capital spending in the shale industry is estimated to have reached around $120 billion in 2014, more than double its value 5 years earlier. The increase in productivity is even more striking, with productivity in tight oil plays increasing 7-fold since 2007.

As the result, U.S. oil production rose by 1.6 Mb/d in 2014, by far the largest growth in the world, and the first time any country has increased its production by more than 1 Mb/d for three consecutive years. The level of U.S. oil production in 2014 exceeded the previous peak set in 1970 – peak oil indeed! And perhaps most significant of all, the U.S. passed both Saudi Arabia and Russia to become the worlds' largest oil producer for the first time since 1975. U.S. shale gas also continued to grow strongly, with U.S. production accounting for nearly 80% of the total increase in global gas supplies in 2014. The revised data in this year's Review, suggest that the U.S. overtook Russia in 2013 to be the world's largest producer of oil and gas combined.





We are truly witnessing a changing in the world order of energy suppliers.

The implications of the shale revolution for the U.S. are profound. U.S. net imports of oil in 2014 were less than half their 2005 peak levels. The U.S. is no longer the world's largest oil importer; China now holds that dubious honour.

In 2007, just prior to the financial crisis, the U.S. was running a current account deficit of 5% of GDP – a key part of the so-called global imbalances that underpinned the financial crisis. Importantly, U.S. energy imports accounted for almost half of that deficit. Just seven years later, in 2014, U.S. energy imports comprised just 1% of GDP, and U.S. production accounted for almost 90% of its energy needs – a level not reached since the mid-80s. And as we discuss below, the impact of the U.S. shale revolution spread far beyond its national borders.

The second factor shaping global energy markets last year were developments in China, driven by the faster pace of its structural economic adjustment. Chinese GDP growth slowed to 7.4% in 2014, significantly weaker than the double-digit growth rates in the first 10 years or so of this century. This slowing was accompanied by a continuing shift in the pattern of growth, with real estate investment and parts of industrial production decelerating sharply. As a consequence, growth in some of China's most energy-intensive sectors such as steel and cement – sectors which had thrived during China's rapid industrialization – virtually collapsed in 2014, while more service-orientated parts of the economy came to the fore.

This changing pattern of economic growth caused the growth of China's energy consumption to slow sharply to just 2.6% in 2014, less than half its average over the past 10 years (6.6%) and the weakest rate of growth since the late 90s.

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Although the slowdown in China's energy growth is striking, the implied reduction in energy intensity – i.e., the reduction in the average amount of energy needed to produce each unit of GDP – was not particularly exceptional relative to that seen over the past 20 years or so. What was extraordinary – and is perhaps the single most striking data point in this year's Statistical Review – was that this slowing in the growth of China's energy demand caused China's coal consumption to essentially stall in 2014. Given that China accounts for over 50% of world's coal demand, developments in China had profound impact on global coal markets and carbon emissions as we shall see shortly.

Even though this restructuring of the Chinese economy is likely to continue, it is likely that the improvement in energy efficiency may not persist at the very rapid pace seen in 2014. Those exceptionally low levels of growth reached in the energy-intensive sectors are perhaps unlikely to be sustained, pointing to the possibility of some bounce-back in energy demand. More generally, we might expect to see the rate of decline in China's energy intensity to taper off gradually as it converges to the levels of more developed economies.

The third over-arching factor acting across the global energy landscape in 2014 was the continuing focus on climate and environmental issues. Climate concerns were an obvious focus last year as global leaders and campaigners mapped their course to Paris at the end of this year. Considerable attention was also placed on broader environmental concerns, with a number of significant regulatory announcements, including in both the U.S. and China. These policy initiatives, together with changing societal preferences and technological improvements had an important bearing on the fuel mix and the role of non-fossil fuels.

Renewables accounted for almost a third of the total increase in primary energy in 2014, and an even greater proportion of power generation growth. The share of non-fossil fuels in primary energy consumption reached an all-time high of almost 14%. Due to a combination of slower energy demand and the shift in the fuel mix, global carbon emissions from energy use have risen by just 0.5% last year, the slowest rate of growth for over 15 years, excluding the global recession of 2009.

The best place to start tracing how did these different forces – the strength of U.S. shale, the rebalancing of China's economy, and the continued focus on climate and environmental concerns – play out across the global energy markets, is by looking at key features in last year's data.

Key Features of 2014

The big overriding picture of 2014 was one of surprisingly weak growth in energy demand, coupled with greater resilience in energy production growth and a consequent softening in energy prices. Growth of primary energy consumption slowed to just 0.9% last year, which, absent the financial crisis, is the slowest growth of energy demand since the late 90s. As in much of the past decade, all of the increase in demand was from emerging economies, with energy consumption in the OECD continuing to fall.

Consumption grew more slowly than recent averages in all regions except North America (0.9%) and Africa (2.8%), with a notable fall in EU demand (-3.9%). The sharp deceleration in energy demand occurred despite the global economy expanding (3.3%) at a similar rate to 2013. Instead, the slowdown in energy demand reflected a further fall in energy intensity (-2.3%). A significant part of that reduction can be traced to one-off weather-related impacts, particularly in the EU. But over and above that, was the impact from the rebalancing of the Chinese economy.

Energy production grew by 1.4% in 2014, similar to 2013, but weaker than its 10-year average (2.2%). This relative stability in aggregate supply growth masked significant differences across fuels: with a sharp acceleration in oil supply offset by the first decline in coal production since the Asian financial crisis in 1998. Although developing economies accounted for all of the increase in energy demand, supply growth was dominated by the OECD, which accounted for over 80% of the increase in supply. Over the past 10 years or so, the OECD has enjoyed a significant improvement in its energy balance with a corresponding deterioration in the non-OECD balance.

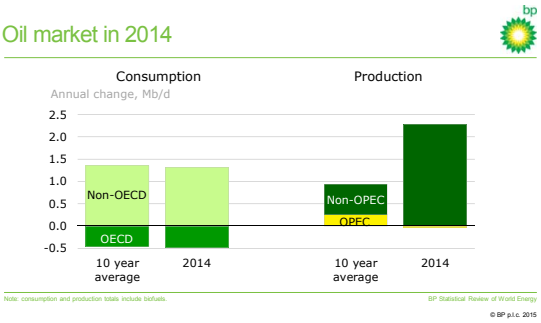
To uncover the stories underpinning those developments we need to delve deeper yet by looking at the individual fuels.

Fuel by Fuel

Oil

Oil was at the epicentre of the 2014 energy storm, as a number of the over-arching forces came together. The data for 2014 as a whole make clear that the sharp fall in oil prices was a supply story. The increase in oil consumption in 2014 was very close to its recent historical average. There was nothing exceptional about demand growth in 2014. In contrast, supply growth last year was almost off the charts, with global production increasing by over 2 Mb/d, more than double its 10-year average.

On the demand side, oil consumption grew by 0.8 Mb/d, entirely driven by increase in non-OECD



demand (1.3 Mb/d), led by China (390 Kb/d). As in 2013, the gains in Chinese oil demand were driven by gasoline consumption, supported by the increasing purchasing power of Chinese households. In contrast, growth in the demand for fuels which are more exposed to the rebalancing away from heavy industry and infrastructure, such as diesel, remained very weak by historical standards. OECD oil consumption fell by almost 500 Kb/d in 2014, in line with its 10-year average, with slightly larger than usual declines in Japan (-220 Kb/d) and Europe (-200 Kb/d), offset by growth in the U.S. (70 Kb/d) where lower pump prices stimulated transport demand in the second half of the year.

The supply strength was driven by non-OPEC production, which increased by 2.1 Mb/d in 2014 – the largest increase on record. U.S. production set the pace, but Canada (315 Kb/d) and Brazil (232 Kb/d) also enjoyed record increases in production, with output in both countries reaching record highs. In contrast, OPEC production was broadly unchanged (36.6 Mb/d). The share of production across OPEC members continued to be affected by supply disruptions in the wake of the Arab Spring. Relative to production levels at the end of 2010, total supply disruptions to both OPEC and non-OPEC production increased a little to close to 3 Mb/d, with those disruptions concentrated in Libya (1.3 Mb/d) and Iran (860 Kb/d).

The exceptional growth in non-OPEC supply far exceeded incremental supply disruptions which, together with a softening in the growth of oil consumption relative to 2013, led to a growing supply imbalance and a consequent build-up of inventories. OECD commercial inventories built steadily in 2014 and recent data showed stocks hitting a record high in May, with U.S. commercial crude stocks at their highest levels since 1930.

As the supply imbalance widened and stocks accumulated, prices began to fall. Dated Brent peaked in the second half of June and Brent forward markets, which had generally been backwardated since early 2011, moved into contango in July. The possibility that OPEC may respond to the growing abundance of supply by reducing its production targets probably provided some support to prices through the summer and autumn, with dated Brent drifting down to around $80 by the time of the OPEC meeting in late November. But the decision by OPEC to maintain its production levels and protect its market share broke the markets' back: prices fell sharply, with dated Brent ending the year at around $55 and reaching a daily low of $45 in mid-January. Dated Brent averaged $99 in 2014 – the first time it has averaged less than $100 since 2010.

One key message to draw from these events is that, even in the oil market, prices work! The high levels of innovation and investment driving the record supply gains which underpin the current surplus were set in motion by a decade of high oil prices. And likewise, the market now appears to be responding to the prompt of lower oil prices. Data so far this year point to a strengthening of demand growth and the number of U.S. oil rigs has more than halved since its peak in October last year.

Refining

The exceptional strength of crude supplies spurred a notable increase in refinery runs, which were up over 1 Mb/d in 2014, more than double their 10-year average. Refinery runs were stronger than the increase in product demand as refineries were incentivised to increase product stocks and so reduce pressure on crude storage. U.S. refineries led the way, with throughputs increasing by over half a million barrels a day – the largest annual increase since the mid-80s – driven by the strength of U.S. supplies and the consequent discounting of U.S. crude prices.

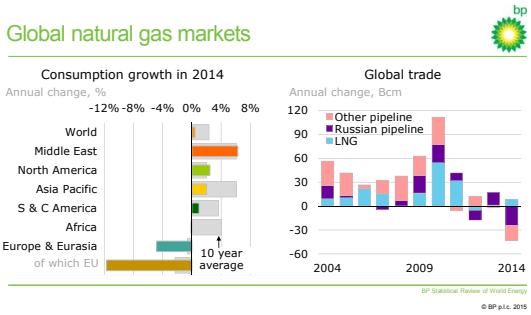
This lengthening in refining runs was broadly matched by the expansion in refining capacity: even with material reductions in the OECD, capacity still increased by 1.3 Mb/d. This growth in capacity was driven by new refineries in China (790 Kb/d) and the Middle East (740 Kb/d), causing spare capacity to edge higher to almost 7 Mb/d above its level in 2005, when we think the global utilization rate was close to its effective maximum. Much of that spare capacity was concentrated in China and the Middle East, which have undertaken significant investments in refining capacity in recent years. Global refinery utilization remained at 79.6%, its lowest level for almost 30 years.

Natural Gas

The main story on natural gas was one of exceptionally weak demand. Global gas consumption grew by just 0.4% (12 Bcm) in 2014, which, with the exception of the financial crisis, is the weakest rate of growth for almost 20 years. In contrast, growth in global gas production (1.6%, 52 Bcm) was relatively

robust, causing gas prices across the globe to decline through the course of the year. This general weakening in gas prices also coincided with a further narrowing of the differential between regional gas prices, reflecting the increasing integration of global gas markets.

The weakness in global gas demand in 2014 was driven in large part by EU demand, which fell by almost 12% (-51 Bcm), the largest decline in EU demand on record and causing gas consumption in Europe to fall back to levels not seen since the mid-90s. A large part of this weakness stemmed from the exceptionally mild winter with the heating degree days in Europe at one of their lowest levels on record. Gas consumption in Asia Pacific was also relatively subdued, with growth slowing to 2.0% (13 Bcm) in 2014, significantly weaker than its 10-year average (6%). The main exception to this story of global gas weakness was, predictably, the U.S., where ample supplies of domestic gas supported consumption, which grew by almost 3% in 2014.



U.S. gas production increased by over 6% (39 Bcm), almost double its 10-year average and accounting for almost 80% of the increase in global gas production. All of that growth was due to increases in shale gas, which grew by over 13%, with the vast majority of that growth stemming from Marcellus and Utica shale. Gas production in the EU fell by almost 10% (-14 Bcm) in 2014, taking production to its lowest level since the early 1970s. The vast majority of that fall (13 Bcm) was accounted for by the decision by the Dutch government to cap output from the main Groningen field reflecting concerns about possible earthquakes.

Global gas trade fell last year marking only the second decline on record. The weakness was driven by over 6% decline in pipeline trade, the largest decline since our trade data began in 1989. Despite the reduction in European gas output, an even bigger fall in demand meant that gas imports to the EU declined sharply, with pipeline imports from Russia and elsewhere falling by almost 9%, their largest decline on record. The weakness in pipeline gas trade was further compounded by the dispute between Russia and Ukraine, which resulted in Russia's gas exports to Ukraine being turned off between June and December last year. Indeed, lower exports to EU and Ukraine, caused Russia's gas production to fall by over 4% (26 Bcm). The decline in pipeline gas trade was partially offset by an increase in global LNG supplies, which after a pause of two years, increased by 8 Bcm in 2014, with much of that expansion coming from Papa New Guinea.

Coal

For many years, the fortunes of coal have been inextricably linked to China. That was true as China industrialised rapidly, causing coal to be the fastest growing fossil fuel over the first 10 years or so of this century. And it was equally true in 2014 as Chinese demand braked sharply and coal became the slowest growing fossil fuel. Global coal consumption grew by just 0.4% (15 Mtoe), its slowest rate since the Asian crisis in 1998, whilst global production fell (-0.7%, -28 Mtoe). Coal prices responded to this weakening in the coal market, with 2014 prices falling to their lowest level in 5 years.

China's coal consumption grew by just 0.1% (1 Mtoe) in 2014, compared with 2% in 2013 and an average of almost 6% over the past 10 years. Chinese coal production was even weaker, falling by 2.6% (-49 Mtoe). About two-thirds of the slowdown in China's coal consumption can be explained by the general weakness in China's energy demand. Over and above that, coal lost out relative to other fuels, being disproportionately exposed to heavy industrial sectors most severely affected by the economic rebalancing.

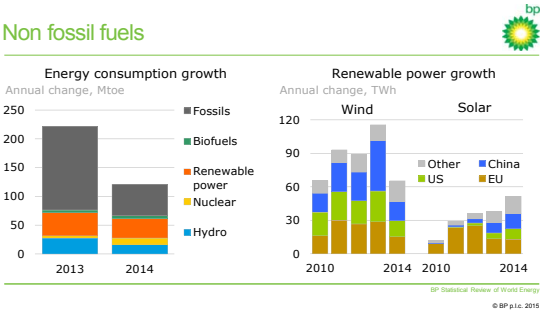
Outside of China, India provided the main source of strength for the global coal market, where both consumption (11.1%, 36 Mtoe) and production (6.4%, 15 Mtoe) grew strongly and posted the largest increments to the global demand and supply of coal. The vast majority of the increased demand for coal in India came from the power sector, enabling total power generation in India to increase by almost 10% in 2014, its strongest rate of increase since 1989. In that context, it's worth remembering that India has one of the largest numbers of people without access to electricity. In a similar vein, Africa (2%) also increased its consumption of coal in 2014. For those most-affected regions, coal can play an important role in improving the accessibility and availability of energy, which is essential for the well-being of their citizens and for the strength of their economies.

Non-Fossil Fuels

Despite a backdrop of slowing energy demand and weak growth in fossil fuels, non-fossil fuels continued to grow robustly, increasing by 3.7% in 2014, comfortably above their 10-year average (3.2%). The relative resilience of non-fossil fuels meant that they provided a bigger contribution (67 Mtoe) to global energy growth than fossil fuels (55 Mtoe) for the first time for over 20 years, other than when the

world economy has been in recession. This is despite the fact that non-fossil fuels accounted for less than 15% of total primary energy. Part of the explanation lies in the fact that year-to-year growth of non-fossil fuels is relatively insensitive to changes in demand conditions, with fossil fuels in effect acting as the swing energy source in response to the energy demand slowdown in 2014.

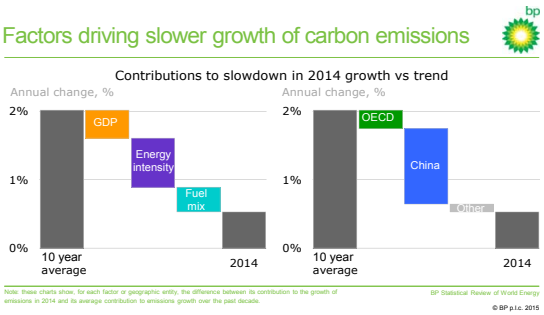
Global hydro (2.0%, 17 Mtoe) and nuclear (1.8%, 10 Mtoe) power generation both grew in 2014, driven by policy, capacity growth and by weather in the case of hydro. Renewable energy grew by (12%, 34 Mtoe) in 2014, a little below its 10-year average (15.3%). This slowing was driven by wind (10.2%, 15 Mtoe), which grew at less than half its 10-year rate (23.5%), in part reflecting less public policy support in the EU and U.S.. Solar power, which is far less advanced in its development cycle, continued to grow at a breakneck speed (38.2%, 12 Mtoe). However, growth in renewables slowed far less sharply than that for overall energy demand, such that the growth in renewables (including biofuels) accounted for almost a third of the total increase in primary energy in 2014, and more than 40% of the increase in power generation.



Carbon Emissions

The slower growth of energy demand, together with the shift in the fuel mix, had important implications for the growth of carbon emissions. Global carbon emissions from energy use grew by just 0.5% (187 $MtCO_2$) in 2014 marking the slowest rate of growth for over 15 years, other than in the immediate aftermath of the financial crisis. This compares with the average annual growth rate over the past 10 years of 2.0%.

Decomposing the emissions growth into its underlying drivers shows that around a quarter of the slower rate of carbon emissions in 2014 relative to its 10-year average can be attributed to weaker GDP growth: global GDP grew by 3.3% in 2014, compared with a 10-year average of 3.7%. The most important driver – accounting for around half of the slower rate of emissions – was the faster rate of improvement in energy intensity. This largely reflects the changing structure of the Chinese economy, together with last year's unusually mild European winter causing the one-off fall in heating demand. The remainder of the slower growth reflects the greater than average reduction in carbon intensity associated with the changing fuel mix in 2014, particularly the slowdown in coal and the greater contribution of non-fossil fuels. In terms of the contributions of different geographical regions, the vast majority of the slowdown in carbon emissions can be attributed to China, reflecting both the sharp slowdown in consumption growth and the shift in the fuel mix away from coal.



The question is whether these developments in China are likely to persist – potentially signalling the beginning of a lower trend in emissions growth – or whether they are likely to reverse in the near future. There are good reasons for thinking that some of the slowdown in the growth of China's carbon emissions was part of the broader structural rebalancing of the economy that is taking place and is likely to continue. But the extent of the slowdown in 2014 probably also reflected a number of one-off and erratic factors that are unlikely to be repeated and may even get partially reversed.

Conclusions

Following the earlier calm, more normal stormy conditions returned to the world of energy last year. In years to come, it is possible that 2014 may come to be seen as something of a watershed for the energy industry. Not so much because of the near-term volatility associated with the sharp fall in oil prices and the various adjustments that triggered. That volatility is more a return to business as usual. But rather because some of the longer-term trends which are likely to have a huge bearing on the shape of the energy sector over coming years, came to the fore.

The heights scaled by the US shale revolution, sparking a new world order of energy supplies. The rebalancing of the Chinese economy and the implications this has for global energy demand and the fuel mix. And the increasing focus on climate and environmental issues as we all try to tackle the twin challenges of using energy efficiently and sustainably, whilst ensuring it is available and affordable to those that need it most.