Energy in 2015: A year of plenty

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1. Introduction

As Bob mentioned, this is the 65th anniversary of BP's Statistical Review of World Energy.

It's fair to say that the Review started from fairly humble origins.

The first Review – produced by the somewhat ominous sounding Central Planning Department of the then Anglo-Iranian Oil Company – amounted to just six typewritten pages plus a hand-drawn chart.

The Review covered only the oil market and company staff were reminded that its contents were strictly confidential.

Much has changed since then.

The Review started to be made more publically available a few years later.

The Statistical Review of the "World Oil Industry" was expanded to become the Review of World Energy in 1981.

And by the early 1990s, the back data were even made available on a disk, albeit at a price.

Reading back through some of the archives, it is clear that one constant over this entire period is the huge care and commitment of the people responsible for compiling the data.

That was true of the early compilers tasked with estimating oil production in a world almost devoid of official oil statistics.

And it is equally true of today's Economics Team who have worked late into the night over the past couple of months to produce this year's Review.

The value of the Review is only as good as the quality of their work.

So a huge thank you to the Economics Team.

And also to the team from Heriot-Watt University, led by Mark Schaffer and Erkal Ersoy, who yet again provided invaluable help and support in producing this year's Review.

It is very much a team effort.

After so many years, the annual launch of BP's Statistical Review has established itself as one of the fixtures of the Great British summer.

It may not have quite the glamour of the Chelsea Flower Show or the tension of Wimbledon tennis, but it does provide an opportunity to look back at the past year; to understand better the swings and developments in energy markets that we have just lived through.

But as well as looking back, a new Statistical Review also provides an opportunity to look forward.

And we are at a point in time where it is perhaps even more interesting than normal to look ahead to future energy trends.

In particular, it seems increasingly clear that global energy markets are in a state of flux: both energy demand and supplies are changing in profound ways. This year's Statistical Review provides an update on these trends and an insight into how individual markets and fuels are adjusting.

On the demand side, it seems clear that the strong growth in energy consumption associated with the rapid industrialization of China and its integration into the global economy is waning.

The days of double-digit Chinese growth, led by energy-hungry industrial production, are behind us.

This transition in energy demand is reinforced by global efforts to improve energy efficiency and reduce energy intensity. Efforts that will need to be redoubled if we are to have any hope of achieving the goals agreed at Paris.

If energy demand is in a process of transition, global supply is surfing a technological wave.

The past few years have been characterised by rapid technological and productivity gains, increasing the abundance of global energy supplies.

This is truly the age of plenty.

Within fossil fuels, the poster child of these advances has, of course, been the US shale revolution. BP's Technology Outlook, published last year, estimated that the shale revolution had increased technically-recoverable oil and gas resources by upwards of 15%. And data from last year suggest that productivity gains in the Lower-48 continued apace.

The technological advances within non-fossil fuels are arguably even more striking; particularly those within renewable energy led by solar and wind power. Sharp cost reductions have gone hand-in-hand with rapid growth in renewable energy: solar power production has increased more than sixty-fold in the space of 10 years, doubling capacity every 20 months!

The pledges and determination demonstrated at the COP21 meeting in Paris are likely to lead to further policies aimed at shifting the fuel mix towards cleaner, lower-carbon, fuels, with renewable power, along with natural gas, the main beneficiary.

These global trends of transitioning demand and abundant supply came together in 2015, dominating energy markets. This year's Review provides a ringside seat for observing their effects and gauging their possible implications.

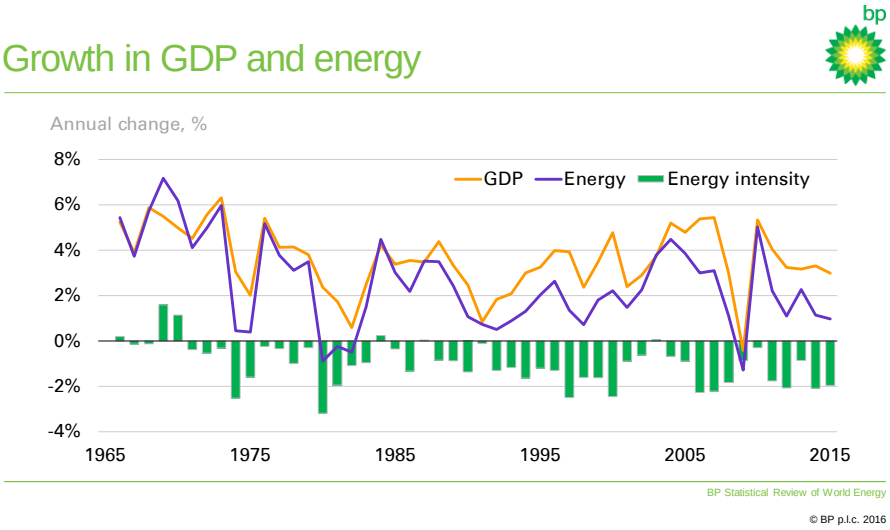
2. Key features of 2015

Before jumping into the detail of how these trends played out across individual markets and fuels, it is useful to get a sense of the big picture.

The gradual transition towards slower growth in energy demand was again compounded by cyclical weakness last year. Global economic growth (3%) remained lacklustre, with much of this weakness concentrated in the more energy-intensive industrial sectors. One manifestation of this weakness in industrial production was that power generation grew less rapidly than total energy for only the second time in 30 years.

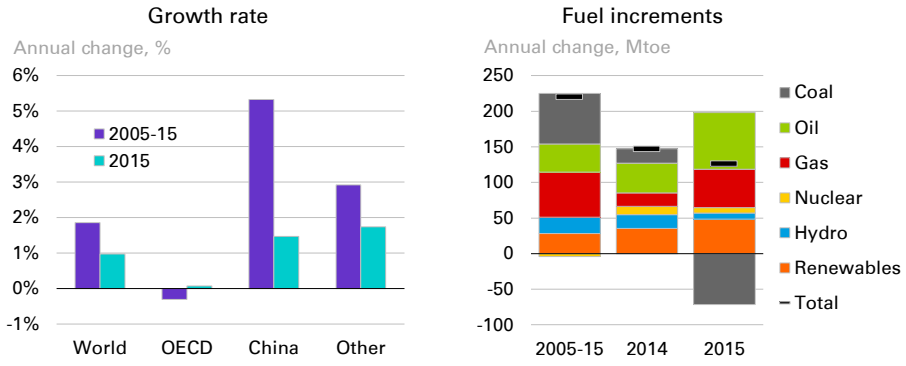
The combination of this gradual transition underway in energy demand compounded by cyclical weakness meant global energy demand grew by just 1.0% in 2015, similar to the rate of growth seen in 2014 (1.1%), but almost half the average rate seen over the past 10 years (1.9%).

The sluggish growth in energy demand meant that energy intensity – the average amount of energy needed to produce a unit of GDP – declined by 2%. Although broadly similar to the rate of decline seen for much of the past 10 years (except immediately after the financial crisis), it's striking that in a year when energy prices fell sharply, energy intensity still declined as much as it did.



The weakness in energy demand was concentrated within developing economies: energy consumption outside the OECD increased by just 1.6% in 2015, less than a half of its average growth over the past 10 years. The main driver was China, where growth in energy consumption slowed to just 1.5%, its weakest rate of growth since the late 1990s prior to its period of rapid industrialization. Even so, China remained the world's largest growth market for energy.

Energy growth



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The story in terms of individual fuels is one of haves and have-nots.

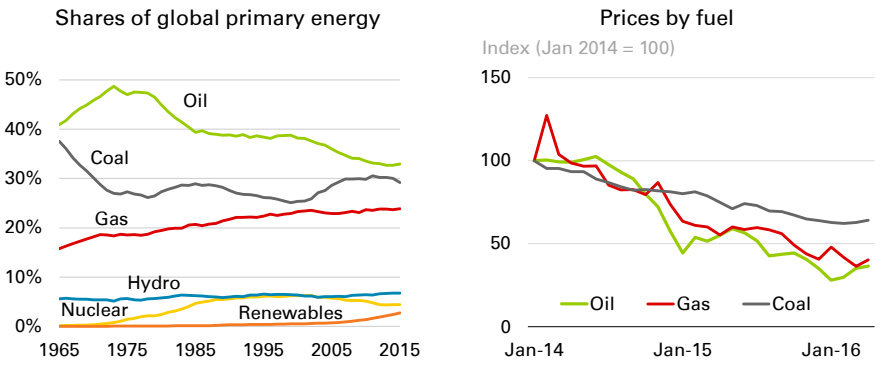
Despite the weakness in energy demand, 2015 saw solid growth in: oil (80 Mtoe, 1.9%), buoyed by the sharp fall in oil prices, with its share in primary energy increasing for the first time since 1999; natural gas (54 Mtoe, 1.7%) as it bounced back from the weather-induced weakness of 2014; and, as I just highlighted, renewable energy in power (48 Mtoe, 15.2%).

The main casualty was coal, which saw its largest decline on record (-71 Mtoe, -1.8%,), driven by large falls in the US and to a lesser extent China, with its share in primary energy falling to its lowest level for a decade.

Despite these differences across fuels, it's possible to identify some common features as to how these twin forces of slower demand growth and abundant supply played out across energy markets last year.

Most obviously (and predictably) is that energy prices fell sharply in response to the imbalance between demand and supply: prices of oil, natural gas, and coal were all sharply lower.

The fuel mix and prices



The extent of the price falls partly reflects that, unlike some times in the past, key suppliers did not make offsetting adjustments to help stabilise prices. That is true of OPEC's response to the rapid gains in US tight oil. It also appears to be the case for Russian gas exporter's response to increasing competition from liquefied natural gas (LNG).

The important point here is that ceding market share in order to support prices is less attractive when the underlying cause of the imbalance is expected to persist, rather than be relatively short-lived.

The other common feature is that in energy markets, as with other markets, prices work!

There are clear signs that energy markets responded to the signal provided by lower prices: demand in some cases was boosted; supplies in the form of current activity or future investment was severely curtailed; the fuel mix adjusted. There is still further to go. And in some markets, notably oil, the adjustment process was offset by non-price led developments. But even so, an adjustment process does appear to be underway which bodes well for future market stability.

That's the big picture of 2015.

Now let's dig a little deeper and consider each of the main fuels in turn.

3. Fuel by fuel

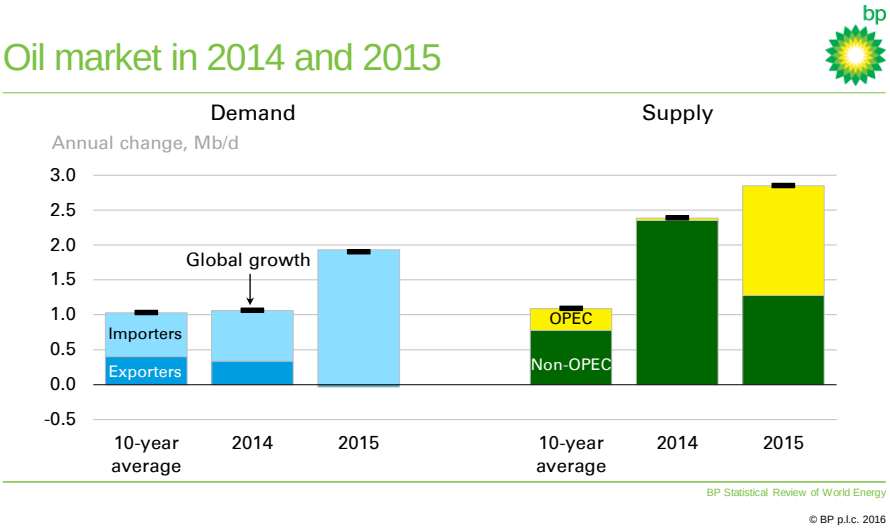
Oil

Those of you with a good memory may recall that I showed a chart similar to this at last year's launch.

The key point I drew from the earlier version of this chart was that the sharp fall in oil prices in 2014 was a supply story. The increase in oil consumption was very close to its historical average: there was nothing particularly unusual about the growth of oil demand in 2014. In contrast, supply – or more accurately non-OPEC supply – had grown exceptionally strongly, led by US tight oil, triggering a sizeable supply imbalance and the consequent fall in oil prices.

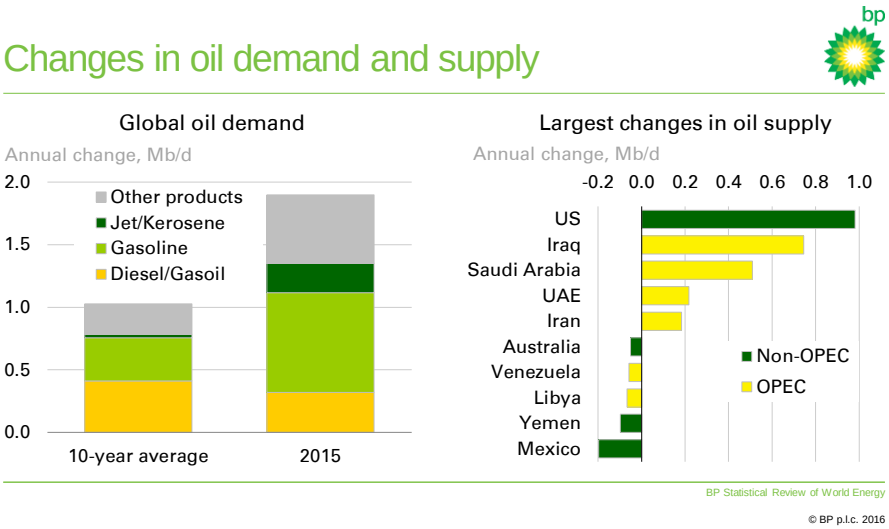
The story for 2015 is that the oil market responded to this sharp fall in oil prices, but that this adjustment was offset by non-price led developments.

Let me explain.



Global oil demand is estimated to have grown strongly last year: up 1.9 Mb/d, nearly twice its 10-year average (1.0 Mb/d). This strength was driven by net oil importers: the US (0.3 Mb/d), EU (0.2 Mb/d), China (0.8 Mb/d), and India (0.3 Mb/d) all recorded unusually strong increases. In contrast, demand growth within oil exporters was, unsurprisingly, weaker than usual.

The strength in oil demand was most pronounced in the consumer-focussed fuels, particularly gasoline and jet fuel, buoyed by the boost to consumers' purchasing power from low oil prices. Growth in diesel consumption, which is more exposed to industrial activity, was more subdued.



On the supply side, the impact of low oil prices was felt most immediately within US tight oil.

US oil rigs peaked in October 2014 at a little above 1600, falling by around two-thirds by the end of last year. The strong gains in rig productivity meant that the slowing in output growth was less pronounced, with total US production still increasing by 1.0 Mb/d in 2015. In doing so, the US reinforced its position as the world's largest oil producer.

Even so, the increase in US production was considerably smaller than in 2014 (1.7 Mb/d), pulled down by falls in US tight oil which peaked in March last year and is currently around 0.5 Mb/d off its highs.

The longer lead times and higher levels of sunk capital meant other production was less affected than US tight oil. Total non-OPEC supply increased by 1.3 Mb/d, with Brazil, Russia, UK and Canada all registering production increases.

But don't be fooled: this comparative resilience of other types of production is partly a matter of timing. Investment in oil and gas-related projects is estimated to have fallen by around $160bn in 2015 – around a quarter off its 2014 level, which is the largest proportionate fall since the late 1970s.[1] And capital spending has continued to fall sharply this year. Although some of the reduction has been matched by cost deflation, the lower levels of investment will inevitably detract from future supply growth. Indeed, a key issue for the next few years is the impact this reduction in capex will have on future output growth and the risk that this will cause the oil market to tighten excessively.

If that was all that had happened last year, the combination of strong demand growth and smaller increases in non-OPEC supply would have gone a long way towards rebalancing the oil market.

As I said: prices work!

[1] Global nominal oil and gas industry capital expenditure data are from Wood Mackenzie (as of 10 May 2016).

But that wasn't all that happened: OPEC supply increased substantially, by 1.6 Mb/d to a new record of 38.2 Mb/d.

Rather than a general increase in OPEC supply, it is perhaps more accurate to describe this as an increase in production of two OPEC members: Iraq (0.7 Mb/d) and Saudi Arabia (0.5 Mb/d), which together accounted for the majority of the increase.

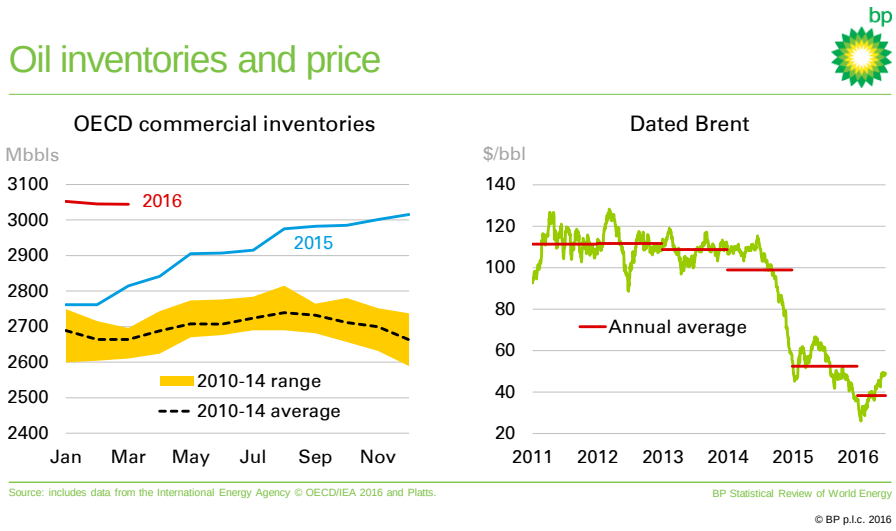
The net result was that, despite the adjustment in the price-sensitive components of oil demand and supply, the increase in aggregate oil production (2.8 Mb/d) again outstripped that of demand, further adding to the supply imbalance.

The adjustment to lower prices has continued this year, with indicators pointing to solid demand growth and a decline in non-OPEC supply. Based on current trends, it seems likely that the market will move broadly into balance in the second half of this year.

But to be clear: that doesn't mean the problem is solved, it simply means the problem in terms of accumulating oil stocks stops getting worse!

Crude and product stocks increased further from their already bloated levels: OECD commercial inventories rose by 280 Mbbls over 2015 as a whole, ending some 350 Mbbls above their 5-year average. Although comparable data for the non-OECD are not available, it is likely that non-OECD inventories also rose further.

The market will only truly return to normal when the sizeable stock overhang has been worked off.

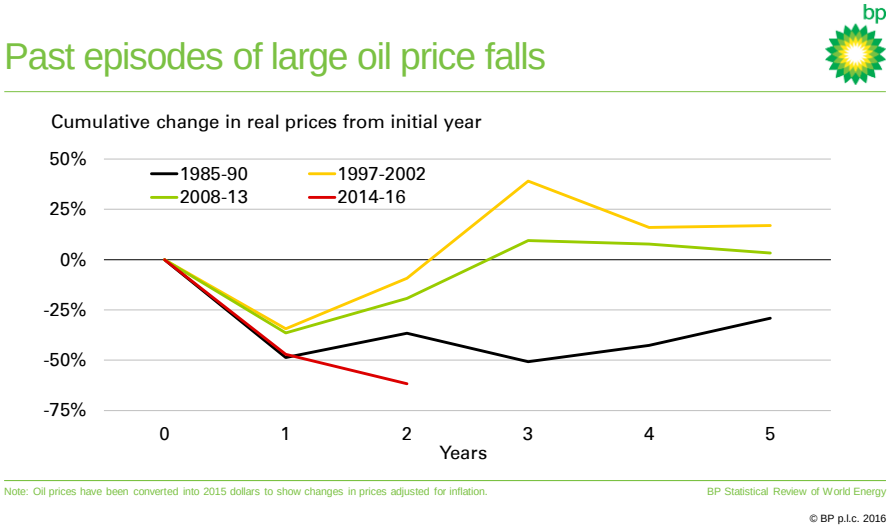


As you would expect, the persistent supply imbalance and growing inventory levels weighed on oil prices, which fell sharply towards the end of 2014 and into 2015, before recovering somewhat in the early part of last year as demand strengthened and US tight oil peaked. But prices fell back in the wake of the increases in Iraqi and Saudi Arabian production, reaching a low point of $36 towards the end of December. Dated Brent averaged $52 in 2015, its lowest (nominal) annual average since 2004 and almost 50% below its 2014 level.

Comparing the recent fall in prices with previous episodes of sharp price declines, the experience so far has followed a pattern closer to that seen in the mid-1980s, than in either 2008-9 or 1997-8.

The latter two shocks were driven by sharp contractions in demand growth which reversed relatively quickly. In contrast, the mid-1980s price fall was driven in large part by new sources of supply, as new production from the North Sea and Alaska came on stream. This led to a more protracted period of weak prices as the market had to gradually absorb the additional supply.

Although different in many respects to the mid-1980s, the underlying cause of the current price weakness was also supply driven, in this case an increase in supply from US tight oil. As a consequence, as Bob suggested from the outset, prices have been lower for longer.



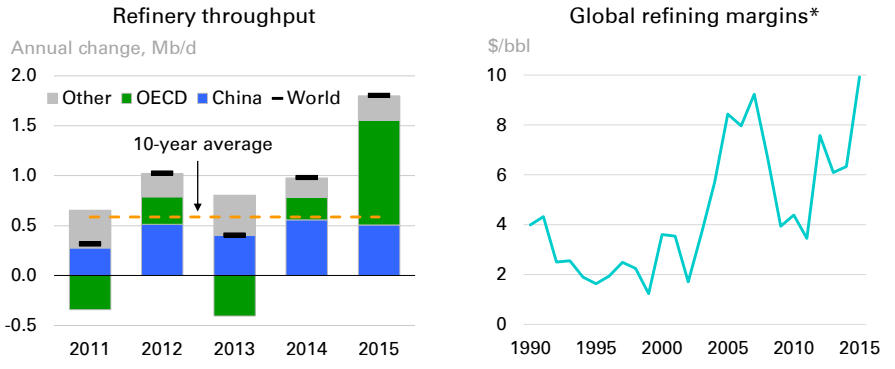
Refining

As with many things in life: one person's loss, is another's gain.

The sharp increase in crude supplies and fall in prices led to a buoyant year for refining.

Refinery throughput rose by 1.8 Mb/d in 2015, more than triple its 10-year average growth, with margins increasing to near-record highs. Reflecting the diverging trends in product demand, gasoline cracks reached their highest levels on record, whereas diesel cracks fell back. The strength of margins encouraged refiners to increase product stocks, easing pressure on crude storage capacity and taking OECD product stocks to more than 100 Mbbls above recent averages.

Refinery throughput and margins



* Average of regional margins, as defined in the Statistical Review.

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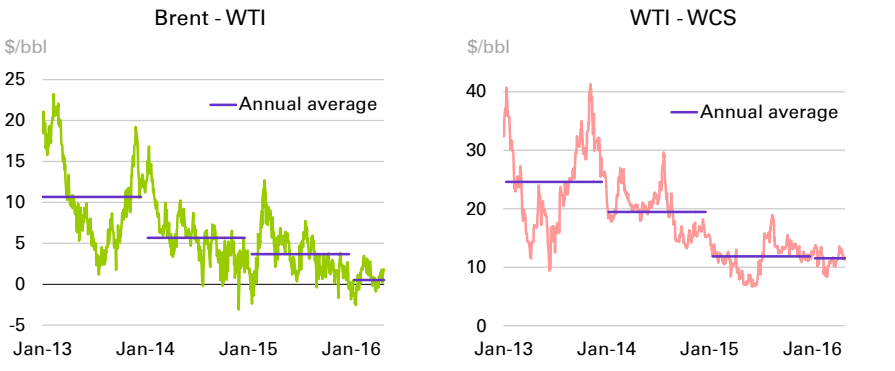
The increase in refining runs dwarfed the expansion in refining capacity (0.5 Mb/d), such that refining utilization increased by 1 percentage point to 82.1%, its fastest increase since 2010. Indeed, capacity grew at its slowest rate for over 20 years, as past decisions to delay several projects in China were felt. More recently, restrictions on China's so-called teapot refineries were relaxed, also helping utilization to increase.

Improvements to US infrastructure meant that, despite the abundance of supplies, North American crude differentials narrowed further last year, with Brent-WTI averaging around $3.7/bbl and the spread between WTI and Western Canadian Select (WCS) averaging just $11.9/bbl.

2015 saw the repeal of the ban on US crude exports outside of North America which dated back to the aftermath of the Arab Oil Embargo in the mid-70s. Given the declines in US production, relatively little US crude has been exported so far. But the lifting of the ban means there is now more of a natural ceiling on Brent-WTI as and when US production begins to pick up again.

Crude oil differentials



Source: includes data from Platts.

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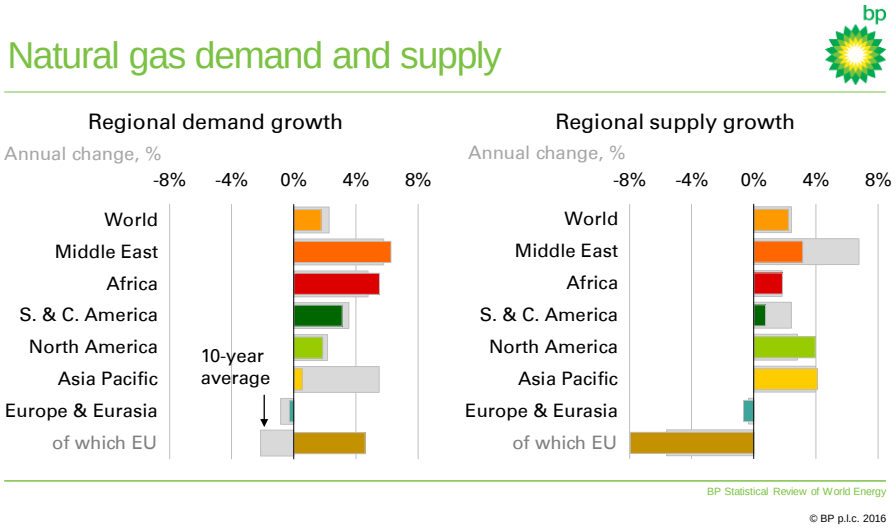
Natural gas

The big picture on natural gas last year is one in which growth in global production remained relatively strong, but demand outside of the power sector was subdued, leading global prices to fall sharply: Henry Hub fell 40% relative to its 2014 average; Japan Korea Marker 46% and NBP 21%. These price falls, which were exacerbated in Asia and Europe by the decline in oil prices, helped to balance the market by allowing gas to gain share in the power sector, the most price-sensitive component of gas demand.

All told, aggregate gas consumption increased by 1.7% (58 Bcm) in 2015, significantly stronger than the weather-induced weakness seen last year (0.6%), although still below its historical average (2.3%).



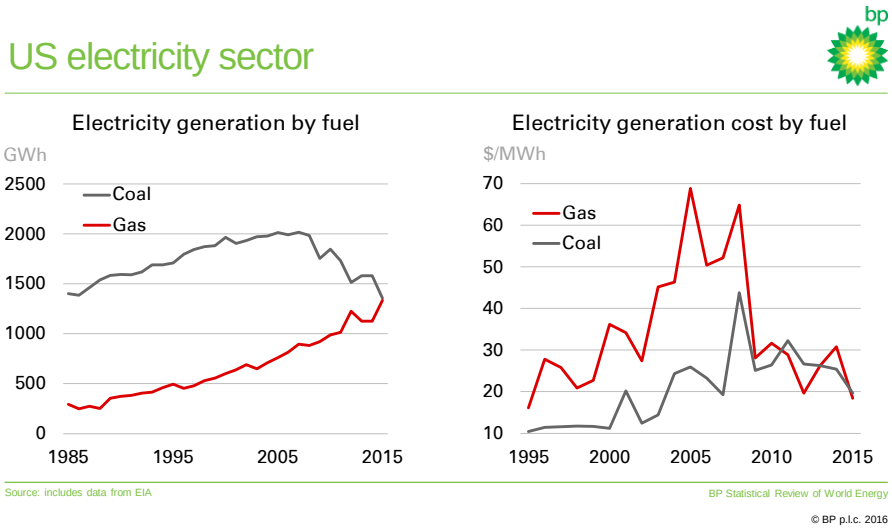
But as always with natural gas, this broad narrative disguises considerable variation across different countries and regions.

On the demand side, the key source of weakness was Asia, where growth in gas consumption slowed to just 0.5% (3 Bcm). The big drag was China, where growth fell to below 5% in 2015, down from double-digit growth seen over much of the past 10 years, reflecting both the general slowdown in China's energy demand and increasing competition from alternative fuels. In the US, the mild winter and weak industrial production meant gas demand outside of the power sector fell last year. In contrast, gas consumption in the EU (16 Bcm, 4.6%) bounced back from the depressing effects of the exceptionally mild winter in 2014. And the Middle East also recorded strong growth (26 Bcm, 6.2%), as new sources of production came on stream.

On the supply side, the US remained the global powerhouse, with output growing by over 5% (39 Bcm) in 2015, accounting for more than half of the increase in world production. All of this increase was driven by US shale gas; conventional US gas production fell. In addition to the US and the Middle East, there were also notable supply increases in Norway (7.7%, 8 Bcm), China (4.8%, 6 Bcm) and Australia (9.4%, 6 Bcm).

Standing back from the detail of the country-specific movements, three general features of last year's gas market struck me as particularly interesting.

First, natural gas gained significant share from coal within several major power markets around the world. These gains were most striking in the US, where the increasing price competitiveness of gas relative to coal allowed gas by the middle of last year to overtake coal as the dominant source of energy in the US power sector.

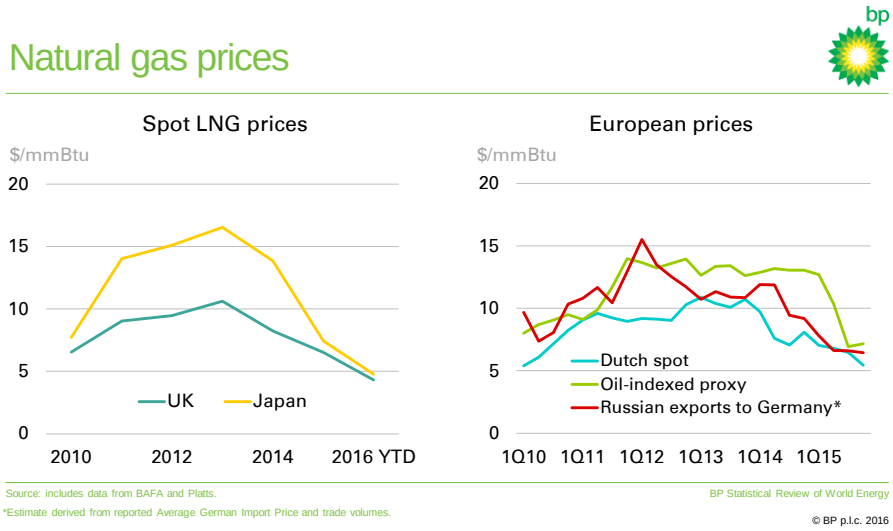


The second interesting feature was the changing trade pattern of global LNG.

LNG supplies rose by around 6 Bcm in 2015, with increases in Australia, Papua New Guinea and Qatar more than offsetting the disruptions to Yemeni supplies. The deceleration in China's gas consumption, combined with falls in South Korea (5 Bcm) and Japan (5 Bcm), meant that after being the primary growth market for LNG over the past 5 years or so, Asian LNG demand fell in 2015. As a result, LNG flows were diverted west, with increased LNG imports to both Middle East and North Africa (MENA); and Europe. This shift in the pattern of trade flows went hand-in-hand with a sharp narrowing in price differentials, with the Asian premium over European gas prices virtually disappearing.

The key takeaway here is that, as global LNG supplies grow in importance and, as a consequence, global gas trade becomes increasingly price sensitive; the impact of shocks or disturbances in one part of the world, in this case weak Asian demand, will be increasingly transmitted to other parts of the globe.

We are moving towards a globally integrated gas market.



The final feature I want to highlight stems from this greater abundance of LNG flowing into Europe and the corresponding fall in European gas prices. In particular, to consider how Russian exporters responded to this increased competition.

Given that much of Russia's gas exports to Europe are indexed to oil, one option would have been to maintain that link, although the flexibility built into those contracts means that might have resulted in some loss of demand. The alternative would have been for Russia to compete on price in order to maintain their market share.

Unfortunately, since rebates and discounts are granted on a contract specific basis it is not possible to observe Russian gas prices directly. But to get some idea, it is possible to back out a proxy for Russian export prices to Germany by using data on Average German Import Prices (AGIP) and the composition of those imports. Although this proxy is somewhat crude – and so I don't want to claim too much for it – it does suggest that Russian export prices to Europe fell more quickly last year than a simple link to oil prices would have implied, and have remained close to European spot prices.

As I mentioned earlier – and as we have seen with OPEC's response in the oil market – the option of giving up market share in order to support prices is less attractive if the source of the price weakness, in this case increased supplies of LNG, is expected to persist.

Coal

Turning next to coal.

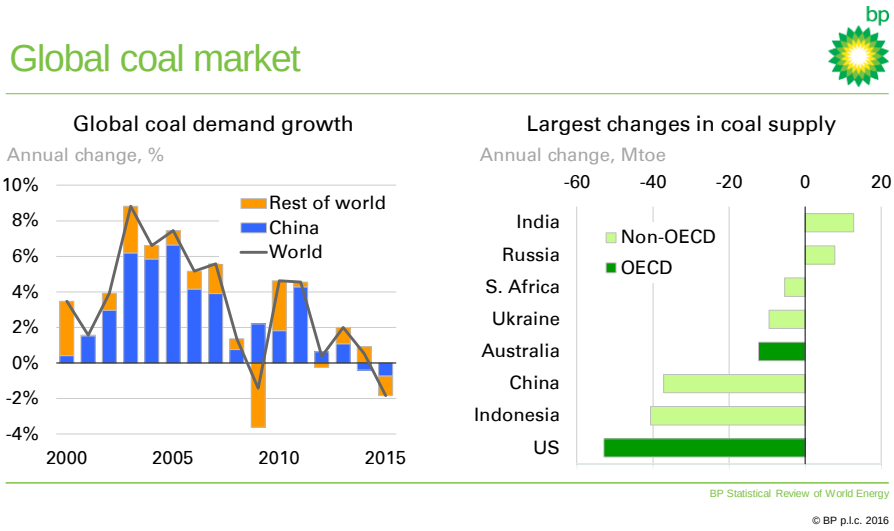
To borrow a phrase used in a very different context: I think it's fair to say that 2015 was, undoubtedly, an annus horribilis for coal.

Global consumption (-71 Mtoe, -1.8%) and production (-159 Mtoe, -4.0%) both recorded their largest falls on record, and coal prices fell by around 20%.

To a large extent, coal was a casualty of the larger, secular, forces driving global supply and demand.

The main manifestation of the technological wave driving energy supplies was the shift in the fuel mix in the US power sector that I just mentioned: the strong growth in US shale gas forced down US gas prices, causing gas to displace coal in the power sector. The switch, which was reinforced by tightening environmental policies, caused US coal consumption to fall sharply (-57 Mtoe, -12.7%).

In contrast to 2012 – the last time US coal consumption fell sharply – the general abundance of global coal supplies last year meant the surplus domestic US coal could not easily be exported to other parts of the world. Instead, US coal production also fell markedly (-53 Mtoe, -10.4%).



The process of transition underway in energy demand was seen most starkly in China. As China's period of rapid industrialization has come to an end, its demand for coal has slowed sharply.

Indeed, China's coal consumption fell for the second consecutive year in 2015 (-29 Mtoe, -1.5%), as Chinese industrial production braked more sharply than the rest of the economy and coal also lost out to increasing competition in the power sector.

Chinese coal production fell by a broadly similar amount (-37 Mtoe, -2.0%); Indonesian production also fell sharply (-41 Mtoe, -14.4%) as its key export market contracted.

The two billion tonne question – or, more accurately, the two billion tonnes of oil equivalent question – is whether we have now seen the peak in Chinese coal consumption?

There are clearly powerful structural factors pushing in this direction: most notably the shifting pattern of Chinese growth towards slower, more service-orientated growth; and the clear determination to switch to cleaner, lower-carbon fuels. But the falls in coal consumption last year were compounded by a sharp slowing in some of China's most energy-intensive – and coal-intensive sectors: output in Iron, steel and cement all fell in

absolute terms last year. It would be very surprising if there wasn't a strong cyclical element to these movements.

The net impact of these opposing forces is to my mind unclear.

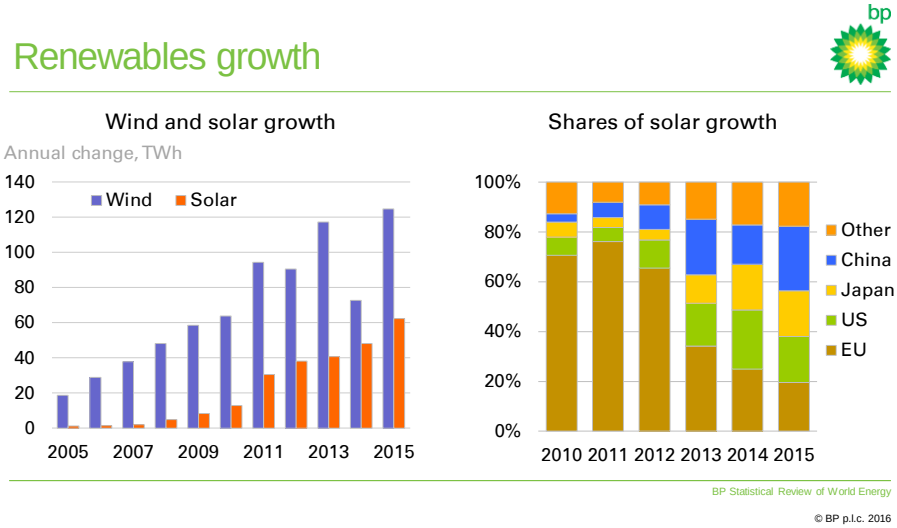
The main source of strength for coal was developing Asia (ex China). India led the way, with both consumption (19 Mtoe, 4.8%) and production (13 Mtoe, 4.7%) growing solidly. As a result, India surpassed the US as the world's second largest coal consumer.

Non-fossil fuels

Non-fossil fuels grew by 3.6% in 2015, up slightly on their average over the past 10 years.

As I stressed at the outset, renewable energy in the power sector further reinforced its reputation as the Next Big Thing: growing by over 15% (213 TWh) in 2015, supported by improving technology and falling costs. Although the share of renewable energy remains small (2.8%), its strong growth meant that it accounted for all of the increase in global power generation in 2015 and more than a third (38%) of the entire increase in global energy consumption.

The increasing importance of renewable energy continued to be led by wind power (17.4%, 125 TWh). But solar power is catching up fast, expanding by almost a third in 2015 (32.6%, 62 TWh), with China overtaking Germany and the US as the largest generator of solar power.



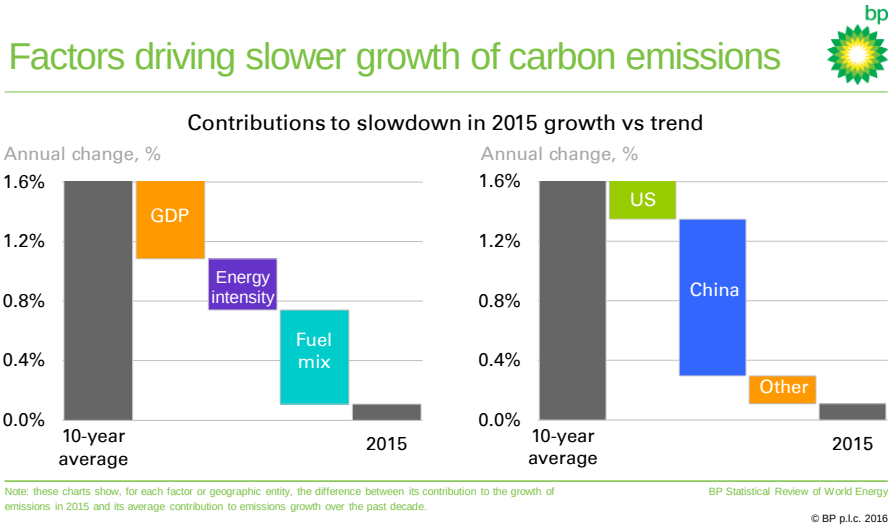
The older stalwarts of non-fossil fuels – hydro and nuclear energy – grew more modestly. Global hydro power increased by just 1.0% (38 TWh), held back by drought conditions in parts of the Americas and Central Europe. Nuclear energy increased by 1.3% (34 TWh), as rapid expansion in China offset secular declines within mainland Europe. This gradual shift of nuclear energy away from the traditional centres of North America and Europe towards Asia, particularly China, looks set to continue over the next 10-20 years.

4. Carbon emissions

Perhaps the most striking number in the whole of this year's Statistical Review is that for carbon emissions.

In particular, the slower growth of energy demand together with the shift in the fuel mix away from coal towards lower carbon fuels meant carbon emissions from energy use were essentially flat last year (0.1%) – the slowest growth in nearly a quarter of a century (other than in the immediate aftermath of the financial crisis).

This marks a sharp turnaround from the growth of carbon emissions over the past 10 years, which averaged a little over 1.5% a year. Some of the slowdown in 2015 is a natural consequence of weaker economic growth relative to the average of the past. But the majority reflects a faster rate of improvement in both energy efficiency and the fuel mix.



Viewed in terms of individual countries and regions, the vast majority of the turnaround in carbon emissions can be attributed to China: China's carbon emissions are estimated to have actually fallen slightly in 2015 (-0.1%) for the first time in almost 20 years.

So will this sharp decline in the growth of China's carbon emissions persist?

As with the decline in Chinese coal consumption, there are good reasons for thinking that some of this slowdown reflects structural forces that are likely to persist and grow in importance. But some probably reflect cyclical factors, particularly the contraction in some of China's most energy-intensive sectors, which are unlikely to keep being repeated and may well unwind in future years.

5. Past clues to future trends

The developments detailed in this year's Statistical Review highlight some of the profound changes taking place in global energy markets as energy demand transitions and as advances in technology enable new and abundant sources of supply.

I want to conclude by speculating, just for a moment, where these forces may lead. In particular, by considering whether the past data, particular those compiled in the Statistical Review, may contain clues to future trends.

I want to consider three key issues for the future: China, renewable energy and carbon emissions.

First, on China: as I said, the recent slowing in global energy demand has been driven to a large extent by developments in China. Not so much by the slowdown in economic growth, but rather by the rapid declines in energy intensity as China's pattern of growth has adjusted.

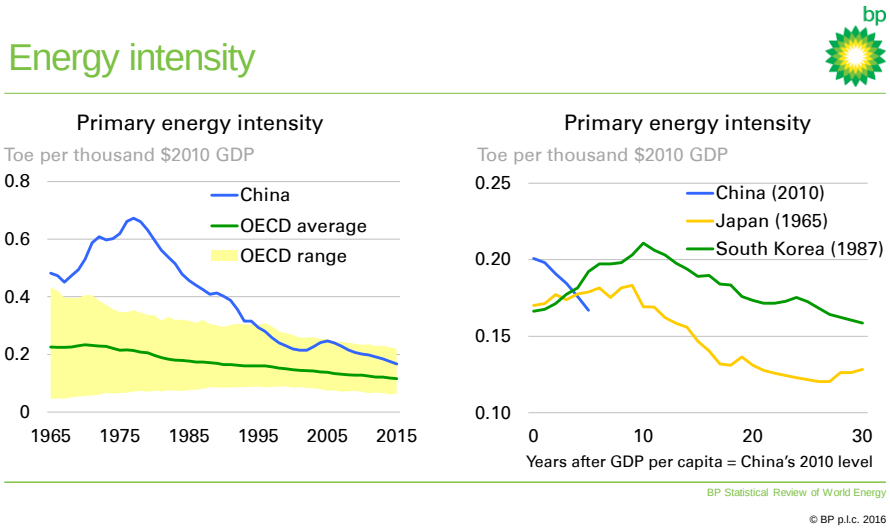
Indeed, if China's energy intensity hadn't declined over the past 5 years, global energy demand would have been almost 5% higher – roughly equivalent to the entire energy consumption of France, Germany and Belgium combined – even with the slowdown in Chinese GDP growth. Future trends in China's energy intensity matter as much, if not more so, for energy demand as its economic growth.

However, the level at which China's energy intensity will start to stabilize is uncertain.

There is considerable variation in energy intensity across developed economies, depending on their industrial structure and their levels of energy efficiency.

Perhaps more instructive is the experience of Japan and South Korea at a similar stage of development. Their falls in energy intensity happened somewhat later in their economic development than in China, but point to extended periods of quite sharp falls in energy intensity. But again here there is significant variation in the level of energy intensity at which they stabilized.

Ultimately, much will depend on the success of China in terms of its twin policy objectives of improving its level of energy efficiency and of shifting towards a more service-based (and hence less energy-intensive) pattern of growth.

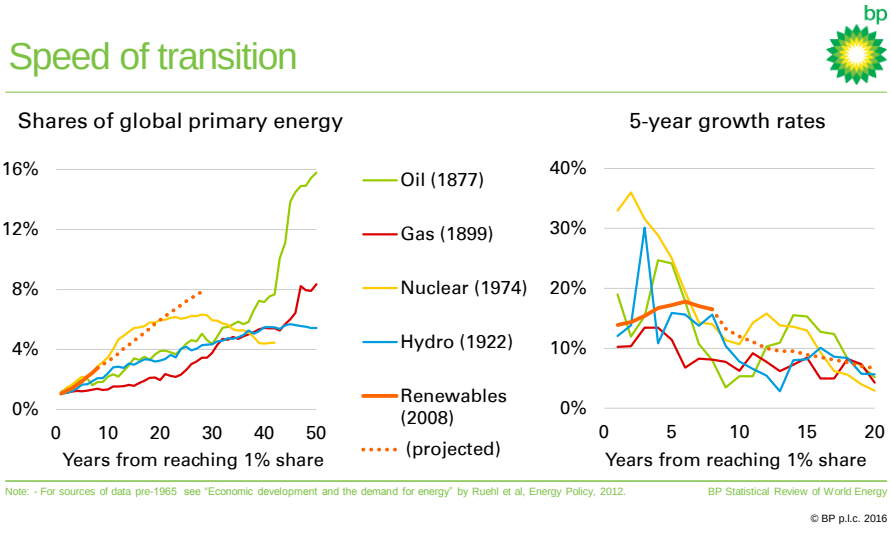


Second, on the supply side, one of the key issues posed by the technological wave fostering new forms of energy is how quickly the share of renewable energy within global demand is likely to grow.

The key lesson from history is that it takes considerable time for new types of energy to penetrate the global market. Starting the clock at the point at which new fuels reached 1% share of primary energy, it took more than 40 years for oil to expand to 10% of primary energy; and even after 50 years, natural gas had reached a share of only 8%.

Some of that slow rate of penetration reflects the time it takes for resources and funding to be devoted in scale to new energy sources. But equally important, the highly capital-intensive nature of the energy eco-system, with many long-lived assets, provides a natural brake on the pace at which new energies can gain ground.

The growth rates achieved by renewable energy over the past 8 or 9 years have been broadly comparable to those recorded by other energies at the same early stage of development. Indeed, thus far, renewable energy has followed a similar path to nuclear energy.



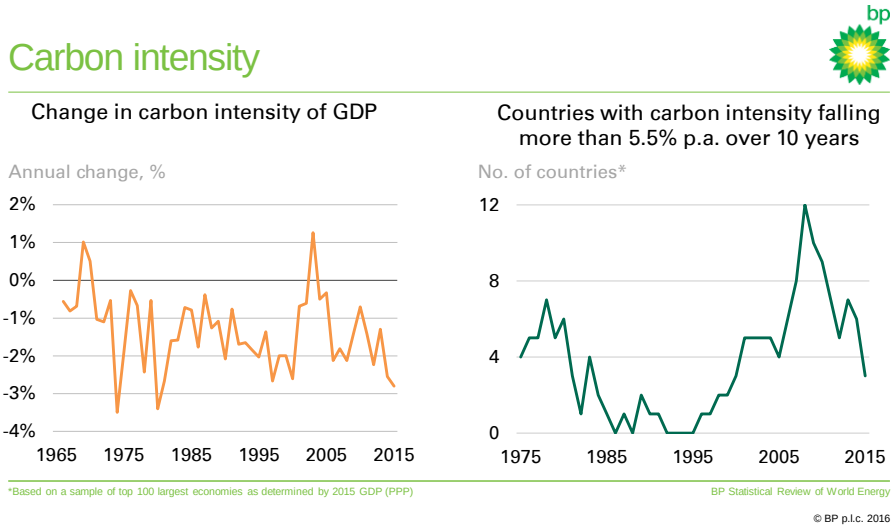
The penetration of nuclear energy plateaued relatively quickly, however, as the pace of learning slowed and unit costs stopped falling. In contrast, in BP's Energy Outlook, we assume that the costs of both wind and solar power will continue to fall as they move down their learning curve, underpinning continued robust growth in renewable energy.

Indeed, the path of renewable energy in the base case of the Energy Outlook implies a quicker pace of penetration than any other fuel source in modern history. But even in that case, renewable power within primary energy barely reaches 8% in 20 years' time.

The simple message from history is that it takes a long time – numbering several decades – for new energies to gain a substantial foothold within global energy.

The third issue is to return to the stalling in the growth of carbon emissions in 2015. This equated to a fall in the carbon intensity of GDP – the average amount of carbon emissions per unit of GDP – of 2.8%. In the past 50 years, there have been only two other occasions in which carbon intensity of GDP has fallen by as much, and they both coincided with sharp upward movements in oil prices.

So real progress.



But before we take too much comfort: the IEA 450 scenario – which is used by many as a benchmark scenario for the progress we need to make to achieve the goals agreed at Paris – suggests that the carbon intensity of GDP has to fall at an average rate of close to 5.5% p.a. on a sustained basis for the next 20 years. So almost double the rate of decline achieved last year, each year for the next 20 years!

It's possible to find a few isolated countries which have achieved average rates of decline of this magnitude for 10 years or so, but these tend to be countries undergoing significant economic transitions and account for only a tiny fraction of global GDP.

So certainly a step in the right direction towards meeting the goals agreed at Paris, but a relatively small step given the scale of the challenge.

6. Conclusions

To conclude.

Many people when they reach 65 are starting to think about winding down: putting their feet up, taking life a little easier.

Not so for BP's Statistical Review.

We are living through some profound changes in global energy markets, as growth in global energy demand transitions and as new energy supplies prosper.

The Statistical Review will have a key role in helping all of us make sense of these changes: by allowing us to understand better the ups and downs in energy markets that we are living through; and by providing some clues as to where we might be heading next.

Indeed, you might say that 65 is the new 40!