

## Global Energy Market Trends—Insights from the 2006 BP Statistical Review of World Energy

By Peter Davies and Neelesh Nerurkar\*

Global energy markets were dominated by high and rising oil prices in 2005 and through 2006 to date. However, this single observation obscures the dynamics of markets that have been operating at high levels of capacity utilisation, but which still maintained supplies to consumers despite a series of disruptions. Supply security was maintained at the cost of spikes in prices. At the same time global energy markets have begun to adjust to higher energy prices and changing relative prices. Using the data from the 2006 BP Statistical Review of World Energy, this article aims to ‘tell the global energy story’ in 2005 and into 2006.

World energy consumption grew by 2.7% in 2005 – down from 4.4% in 2004, but still above the 10 year trend. Energy consumption growth slowed by more than would have been expected given only a modest slowdown in economic growth, suggesting an impact from rising prices. The prices of oil, natural gas, and coal all increased on average during 2005: WTI oil by 36%, Henry Hub natural gas by 50%, and coal by 10%.<sup>1</sup> Coal and gas prices have since declined while oil prices have risen further during 2006. The rise in oil prices has been greater and longer than the rise in gas and coal prices; gas price increases have exceeded coal price increases. In money-of-the day terms, oil prices hit new highs in 2005 and have done so again so far this year, although inflation-adjusted prices remain below previous peaks.

In unravelling the story behind these prices we first establish the context: examining the impacts of the starting point – 2004, an exceptional year for energy markets – and then looking at a variety of factors that shaped energy markets in 2005. We then examine the adjustment of oil, gas, and coal markets around the world. Finally, the emerging issue of energy security is considered.

### The Context

Developments in 2005 can only be explained after taking into account the constraints that emerged in 2004. Strong world economic growth in 2004 drove energy consumption across all fuels. Oil consumption growth was double the ten-year average. Spare capacity became limited in many parts of the energy value chain. World spare oil production capacity fell to low levels; spare refining capacity fell; and upgrading capacity to treat sour or heavy crudes operated flat out. Further, constraints in the contracting and materials sector drove up cost inflation and increased lead times for inputs. Energy prices in 2004 rose to then new highs for all fuels.

The picture was further shaped by a number of exogenous drivers in 2005. Global economic growth remained above trend, only somewhat slower in 2005: 3.6% versus 4.0% in 2004. The negative impact of rising prices on oil consuming economies was less acute than it had been in the

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<sup>1</sup> Central Appalachian coal price index.

early 1980s. Since 1980 world GDP has doubled, while oil consumption has only increased by a third – in other words, oil intensity has fallen by 38%. Similarly, in 1979 oil prices rose 125%; in contrast between 2003 and 2005 oil prices rose by 89%. The negative drag on economic growth from higher oil prices has thus so far been relatively limited.

Weather is always a key determinant of year-on-year changes in energy markets, but 2005 was particularly affected. The weather strengthened energy consumption and weakened production. In the major energy consuming areas, the winter was colder than usual and the summer was hotter than normal. The U.S. hurricane season was hugely damaging. A cumulative 116 million barrels of U.S. offshore oil production and 595 bcf of gas production was lost last year.

Energy markets have also been affected by a number of forces over and above physical supply and demand. Energy and other commodities have increasingly become financial assets. Current events, as well as changes in asset preferences and market expectations, have the power to move market prices rapidly and substantially. Periodically, such preferences and expectations may be independent of or exaggerate energy market fundamentals. Nevertheless, as energy products are ultimately physically deliverable, fundamental forces will always assert themselves in time.

Moreover, the geopolitical situation, especially in oil producing countries, is perceived to have deteriorated. Oil production has been physically disrupted, expansion plans have been delayed, and fears about future political instability have increased. This can to some extent be observed in the rise in long dated forward oil prices that have increased by at least as much as, and often more than, prices for more immediate delivery. In this way, the oil market signalled a need for higher ‘precautionary inventories,’ enabling OPEC to produce in excess of consumption without weakening prices. The shift to a contango market structure – where forward oil prices are above spot prices – gave market participants financial incentives to increase their stock holdings and thus accommodate excess supply.

### Fuel Market Developments

Into this context we saw global energy markets begin to adjust. There was a slowing of world energy consumption growth from 4.4% in 2004 to 2.7% in 2005. This was more of a slowing than the slight weakening of economic growth would tend to imply in aggregate. The largest consumption slowdown was in oil – to 1.3%, somewhat below the 10 year trend rate. The least slowdown was in coal. So on an aggregated basis, energy consumption slowed, and the slowdowns were greatest where price rises were bigger and more sustained.

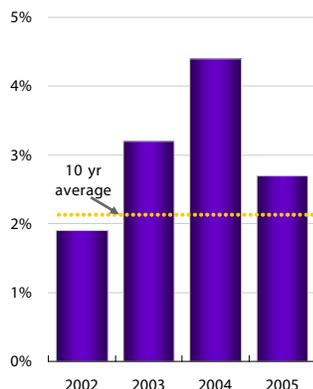
### Oil

After 2004, global spare production capacity was left at low levels – about 1.5 million b/d, according to the EIA. Still, in 2004 and 2005, production remained higher than consumption. This is evidenced by the rise in inventories – more barrels were produced than consumed and storage levels rose.

## 2005 Energy Growth



Growth in World Energy Consumption



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However, this stock build failed to weaken prices. The market was concerned that spare capacity was low relative to potential supply disruptions. Market participants demanded greater inventories in the face of potential disruptions to global supply. In other words, the oil price rise cannot be attributed to ‘fundamentals’ but rather predominantly to an increase in the risk premium.

World oil consumption growth in 2005 slowed to 1 million b/d, 1.3%, which is below the 10 year trend and only 35% of the rate in 2004. Oil consumption growth thus fell by 1.8 million b/d, and over 80% of this slowdown occurred in just 2 countries – the U.S. and China, in roughly equal proportions. U.S. consumption fell due to a combination of the hurricane impacts and price effects. U.S. gasoline consumption had weakened after the hurricanes but recovered before year end. The Chinese slowdown was to a significant degree a reversal of the temporary factors that had stimulated demand in 2004, especially in the power sector where constraints on coal led to greater oil-fired generation in 2004. Oil consumption growth also weakened in the rest of developing Asia Pacific, where many countries reduced subsidies or substituted imported oil with imported gas and coal.

Total world oil production increased by 900,000 b/d – 1%. OPEC supplied 96% of the growth. A number of factors constrained supply growth. The U.S. hurricanes seriously disrupted oil production and delayed new developments. Security problems in Iraq resulted in a production decline. A number of accidents and disruptions to production occurred, for example in the Canadian oil sands or at India’s Bombay High field. There was also a drag on growth due to capacity constraints in contracting and engineering sectors.

Growth by Fuel

	2004	2005
Oil	3.6%	1.3%
Gas	3.3%	2.3%
Coal	6.2%	5.0%
Nuclear	4.2%	0.6%
Hydro	5.6%	4.2%
Energy	4.4%	2.7%
GDP	4.0%	3.6%
Carbon	4.8%	2.9%

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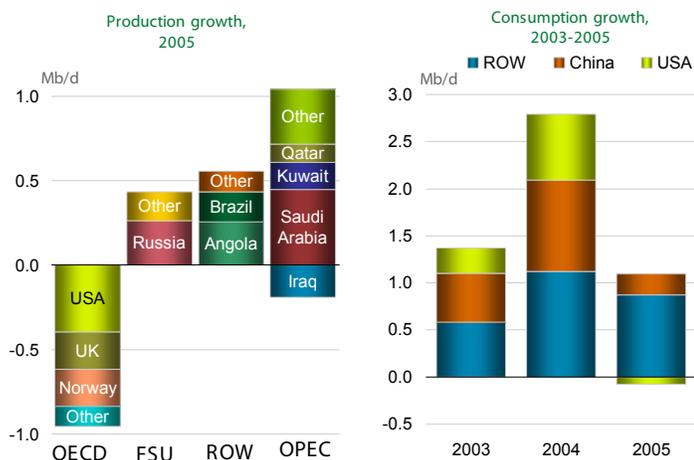
Non-OPEC production was nearly flat. OECD oil production declined by a record 1 million b/d led by a hurricane driven 400,000 b/d U.S. fall and reinforced by declines in the UK, Norway, Mexico and Canada. Offsetting growth came from several non-OECD, non-OPEC countries. Russian production grew by 260,000 b/d and Azerbaijan’s output ramped up as the Baku-Ceyhan line filled. Strong growth was delivered by Angola, Brazil, and China.

OPEC’s production growth of 850,000 b/d was spread across Saudi Arabia, Kuwait, the UAE and Qatar. 180,000 b/d of the growth came from NGLs, of which Qatar was the largest source as LNG output ramped up. Iraqi output fell by 190,000 b/d.

This leaves us with refining. The U.S. hurricanes seriously disrupted refining activity on the U.S. Gulf Coast. After Rita, 5 million b/d of complex U.S. refining capacity was out of action, representing about 29% of U.S. refining capacity. The initial reaction was a ‘super-spike’ in refining margins. This encouraged incremental crude runs at less sophisticated sites around the world. Overall product imports to the U.S. increased sharply to around 4 million b/d in 4Q. As markets rebalanced and in the absence of a cold start to winter, global average refining margins drifted down. Markets had delivered efficiently, assisted by policy support in the shape of EPA waivers and IEA stock release.

Distillation capacity utilization has continued to rise, exceeding 86%, while upgrading units operated effectively at full capacity. There was still almost 12 million b/d of unused primary distillation capacity in 2005. The main constraint in the refining system currently is limited upgrading capacity, exacerbated by the need to process incremental volumes

## Supply and Demand



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of heavy sour crude. From time to time, this has caused a substantial widening of the spread between light and heavy crudes. Refinery constraints have influenced relative crude values but not the absolute price. The experience of the hurricanes proved that much of the remaining refining capacity can be utilised when market conditions provide sufficient incentive. This has served to confirm the efficiency and flexibility of the world refining system.

Overall, these developments have left the world oil market adequately supplied despite supply disruptions. Today's oil prices are held up by low surplus capacity and fears regarding supply risks. Oil consumption has been shown to have some price sensitivity, but the extent of demand reductions has so far been insufficient to weaken prices. Meanwhile oil consumption continues to grow, driven by economic growth around the world. New upstream and refining investments are underway but lead times are long. Global spare production capacity should grow in time and get back to historic norms of around 3 million b/d, probably towards the end of this decade. At that stage the risk premium could decline and OPEC may seek to take a more active role in maintaining market balance.

### Natural Gas

Natural gas developments have not mirrored oil, even though there are some common forces. Gas markets have become increasingly linked internationally, but drivers and outcomes still differ significantly around the world. As with oil, world gas consumption growth in 2005 fell back – but less so, to 2.3% from 3.3% in 2004.

The U.S. hurricanes were especially damaging to gas facilities, cutting supply and driving up prices. Natural gas consumption fell by 1.5% in 2005. There was a direct and indirect hurricane impact on oil and gas consumption, especially around the Gulf Coast. But consumption declines occurred despite more heating and cooling degree days than in 2004. The gas consumption decline deepened a fall especially in industrial gas consumption that stretches back to 2000, largely as a result of high prices. There was a switching back into coal, which saw growth of 1.9%.

However, since January this year U.S. gas markets have shifted dramatically from a period when supply fears prevailed to one of excess supply and high levels of gas in storage. Prices have halved from above distillate parity to below residual fuel oil parity in a matter of months. High prices, both before the hurricanes and after, have weakened demand. This was reinforced by mild weather in the second half of the winter. Markets responded efficiently to both the supply disruption and high prices. LNG imports rose immediately after the hurricanes but then fell back. The cost was temporarily

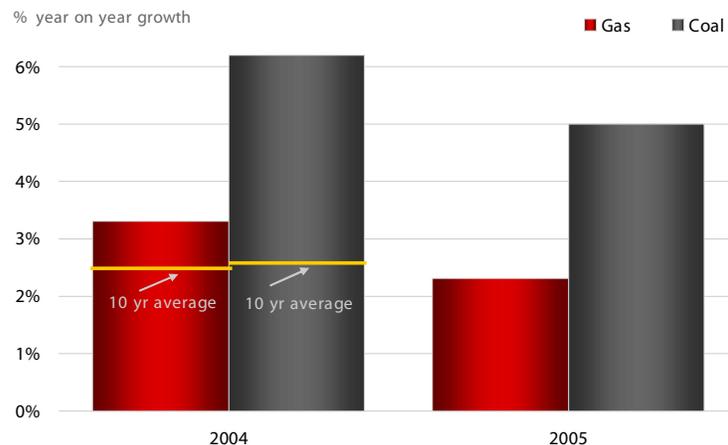
high prices.

A second example of gas market adjustment has been the UK. Declining UK North Sea gas production resulted in the UK becoming a net gas importer for the first time ever in 2004. Following cold weather in November 2005, fears about winter deliverability developed and prices surged to spike at 155p/therm (\$23.5/mmbtu). Then, in February 2006 there was an accident that disabled the Rough storage facility that contains 80% of the UK's gas in storage. Cold weather in March created a further new spike at 187.5p/therm (\$32.78/mmbtu). As in the U.S., markets worked and supply deliverability was maintained. UK gas consumption fell by 2.2% in 2005. Coal consumption increased by 2.8% as the power sector switched fuels. In March 2006 some CCGTs burned distillate on a temporary basis. UK gas prices have now returned to below 40p/therm (as of mid-August). UK futures prices for the winter are higher, implying a risk premium that reflects further concerns over winter availability.

Meanwhile, international trade in natural gas continues to grow faster than consumption as a result of continual expansions in both international pipelines and LNG shipments. 2005 saw a 6% expansion in both pipeline and LNG trade. Natural gas traded across international borders increased to 26% of global consumption. LNG has increasingly connected regional gas markets with some degree of flexibility. However, contract cargoes still dominate the trade. Spot cargoes are estimated to be less than 15% of total LNG volumes. Hence LNG market liquidity is low. Availability was limited in 2005, particularly following the U.S. hurricanes, strong Spanish demand, downtime in Nigeria, and the opening of UK facilities. Nevertheless, the trend points to continuing growth in supplies and for increasingly deep and flexible markets.

The gas story has become more complex. Gas prices have been pulled upwards by rising oil prices and prices

## World Gas and Coal Consumption Growth



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and third largest gas markets. Most recently, gas prices in the U.S. and UK have receded despite rising oil prices. Increasing supply availability, especially through contracted trade and in domestic markets, underpins gas consumption growth in many other markets. On a global basis, gas is no longer the fastest growing fuel.

### Coal

Coal is now the world's fastest growing fuel. This was the case in 2005, in 2004, for the period since 2000 and for the last decade. However, this is only true as a result of China. China consumes 37% of the world's coal, almost all of which is domestically produced. In 2005, China alone represented 77% of the growth in world coal consumption. Chinese coal growth represented 39% of the growth in total energy consumption worldwide in 2005. Excluding China, gas has grown faster than coal. As a result it is appropriate to analyse coal in China separately from trends in the rest of the world.

Chinese coal consumption increased by 11% in 2005. In 2004, coal and coal fired power generation capacity had been in short supply. There had been brownouts, power rationing, and growing use of oil in power. These constraints eased in 2005. About 76GW of power generation capacity was added, of which 83% was coal-fired. The efficiency of coal use in power generation increased. Rail constraints were eased. Coal and power prices were raised. Meanwhile, the power and coal intensity of industrial production fell.

Coal growth outside China has been modest. It grew by 1.8% in 2005, just slightly faster than the 10-year average of 1.5%. The U.S. and India share the role of the biggest volume increases. Coal consumption is also rising throughout Asia alongside imported gas. Russian consumption continues to rise and helps release gas for export. European Union coal consumption fell, but this was concentrated in Germany where subsidies continue to fall. Elsewhere in Europe – the UK, France and Spain – consumption grew, incentivised by lower coal prices.

International coal is now relatively cheap with prices having risen less and having turned down before gas. The cost of carbon has yet to critically impact fuel choice. Fuel choice for future power generation investment is a critical issue, but the economic answer is not yet clear.

### Energy Security

High prices, weather related incidents, and geopolitical tensions have contributed to energy security moving up the agenda globally, with greater attention being paid to the changing geography of oil markets. Since 1995, world oil consumption has increased by 13 million b/d, that is 19% or 1.7% p.a. China represented 27% of the world growth. OECD oil consumption also continued to rise, but relatively slowly – at 1% p.a. As a result, the OECD's share in world consumption slipped from 63% to 59%.

The changes in oil production are a contrast. OPEC's market share has hardly changed since 1995: it edged up from 41% to 42% and remains below its 1973 peak of 53.5%. OECD production fell by 970,000 b/d over the last decade.

Meanwhile, oil production shifted to the Former Soviet Union and to other non-OECD, non-OPEC producers, whose aggregate shares went up from nearly 30% to 34%. OECD net oil imports rose to 59% of OECD consumption in 2005, up from 53% in 1995 and the highest share since 1979.

These broad demand trends look well established. OECD and Chinese oil imports are rising. In the immediately foreseeable future there will be increased oil supplies available from the Former Soviet Union, from other non-OECD, non-OPEC producers, and from OPEC. Rising import dependence worries some consumers. However, the growing levels of trade and the resulting interdependencies should also be grounds for some confidence.

Meanwhile, energy consumers around the world are increasingly expressing their desire to consume energy that is local and green. Renewable energy output is rising rapidly but from a very small base. For example, global ethanol output rose last year by roughly 10%, but is equivalent to 0.4% of global oil consumption. The growth of newly installed wind capacity has now exceeded that of new nuclear power worldwide for 8 years in a row. Aided by government support in many countries, renewable energy's role will rise further, but will inevitably remain small for the foreseeable future.

### Conclusions

2005 has been another dramatic year in energy markets. Energy prices rose to new highs and in 2006 oil prices have risen yet further. 2005 was a year of further above trend economic growth and one when the weather was disruptive, especially the U.S. hurricanes. Global energy consumption growth was also above trend, but not as strong as economic growth alone would predict.

Market adjustments are beginning and will continue. Coal and gas prices have already moderated. There have been price effects on demand. Oil consumption growth slowed and inventories have risen. However, perceptions of rising risk have pushed oil prices up yet further. There has been interfuel competition in some markets. Coal has become the fastest growing fuel driven by Chinese consumption.

Markets have continued to work despite physical disruptions. Supply availability has continued, but at the cost of high prices. This has given rise to concerns about energy security as countries grow more interdependent.



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