

Oil Pricing – Is US\$60/bbl Sustainable?

Peter Strachan – StockAnalysis
SEAAOC June 2006

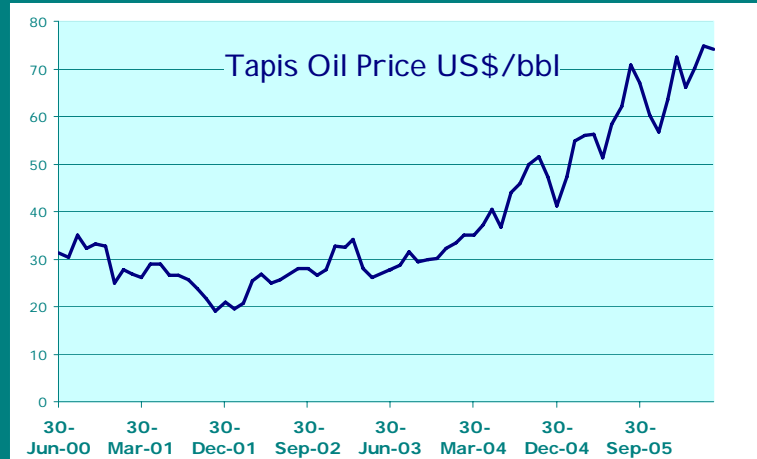
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On behalf of my subscriber based analyst brief StockAnalysis, I am delighted to be invited to address this forum on the outlook for oil and gas prices.

The question before us is: Is US\$60 per barrel a sustainable price? However in light of recent trading, the question could easily have been, Is US\$70 per barrel a sustainable price?

Is Oil Price Really a Function of Supply & Demand?



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Just to remind us of recent history, here is a chart of the Tapis oil price since mid 2000.

Given that this is the last presentation for the day and I am standing between you and the Bar, I will try to quickly come to my conclusions.

Conclusions

- US\$67/bbl provides technical support
- Production lifts in line with demand for 5 years
- Demand to falter, if global economic growth is stymied by high energy costs, leading to oil price trading back towards US\$50/bbl in late 2007 and 2008
- Beyond 2012, oil production unlikely to keep pace with nominal demand growth
- Investment in energy companies with long life reserves makes a lot of sense

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In studying the price outlook for any commodity, a thorough understanding of issues impacting on supply and demand is crucial.

Given steadily growing global demand for oil, the outlook for the oil price is currently largely concerned with the industry's ability to supply.

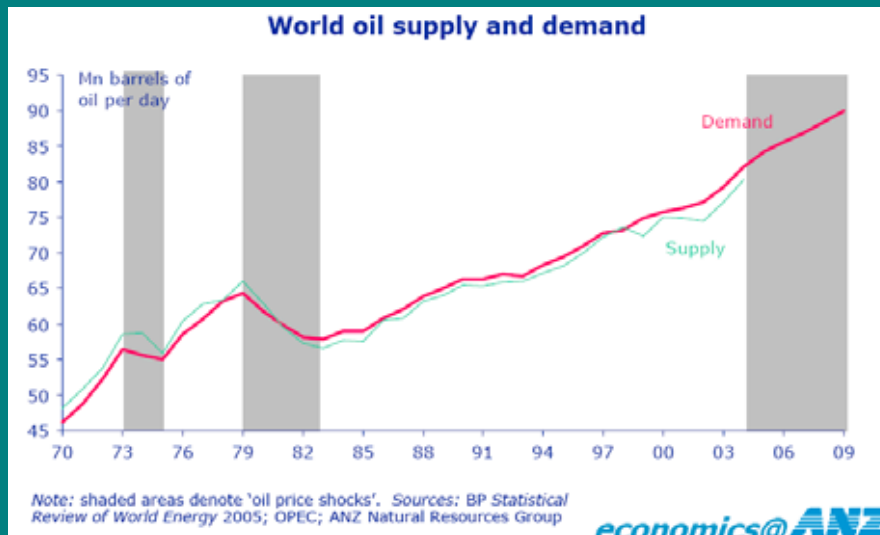
My observation of the oil market leads me to conclude that in the short to medium term, supply is indeed capable of meeting demand growth for oil over the coming 5 years. However, as with all commodities, the demand for oil in 2012 will depend heavily on its price at that time.

My short to medium term oil price outlook is coloured by an expectation of weaker economic growth through 2007 and possibly into 2008.

Looking at global economic conditions, I expect that the oil market might have a short reprieve from its current tight supply/demand conditions during 2007, as weaker economic growth impacts demand growth. However looking further out, additional oil supply is not expected to keep pace with nominal demand growth leading to a real price rise for oil.

The obvious conclusion to this scenario is that investment in energy companies which have long life reserves makes a lot of sense.

35 Years of Demand Growth



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Although oil is now a common and significant part of our daily lives, it is a surprisingly new commodity.

In the latter part of the 19th century, oil was mostly used for cosmetics, pharmaceuticals and some lighting applications. In 1924, global production ran at just 2.77 million barrels per day, with about 84% of that coming from the USA.

In the 1930's, oil was found in the Middle East and by 1957, global oil production had risen to 18.2 million barrels per day and it grew from 36.5 MBOPD in 1967 to 55 MBOPD in 1973 and now stands at around 85 MBOPD.

This graph of supply and demand from the work of Saul Eslake at the ANZ Bank, shows periods of oil price spikes shaded in grey and illustrates how, on previous occasions, supply ran ahead of demand, but prices rose due to the actions of OPEC producers, acting to restrict supply. In contrast to previous periods of rising oil price, the most recent price move has been born of a period where demand growth, largely emanating from newly industrialising nations, has outstripped supply to drag prices higher.

Key Issues

- Supply Issues dominate the market
 - OPEC's buffer down from 8 0 to 1.5 MB/D
 - New oil is largely heavy
 - Nigeria, Chad, Latin America, GOM, Iran . . .
 - Rate of discovery has fallen well below reserve replacement
- Demand is more reliable
 - Price rise is impacting use
 - Petrol sales down
 - Emerging economies drive demand growth

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As I see it, the key issues for oil supply include the following:

OPEC's Buffer has fallen from around 9 MBOPD to less than 2 MB/D. A lot of the Middle East's new oil is heavy and sour, and refining capacity for this product has not kept pace with demand. Oil is mostly consumed in places where it is not produced and so must be transported. There are risks associated with supply and transport of oil from politically and economically unstable producing nations and places such as the GOM, which is likely to be subject to more weather related risks as a result of global warming. Finally, the annual rate of oil discovery has been below the rate of production for over 25 years, so we are pumping the stuff out at ever expanding rates while depleting reserves.

Oil demand is more reliable and has been driven by demand from China and other newly industrialising nations, but will be negatively impacted by a fall in the rate of economic growth and is likely to fall in response to higher costs

Key Issues (cont)

- Gulf reserves not well understood
- Impact of renewables and reduction in use unlikely to be sufficient to reduce upward price pressure
- Peak Oil is close

Region	Production		Gb PD Reserves @ Dep'n Rate				PUD	YTF	Total Reserves	
	mmBOPD	Gb pa	3%	4%	5%	6%	Gb	Gb	High	Low
Gulf	21.0	7.7	255	192	153	128	160	43	458	395
Opec *	34	12.4	414	310	248	207	200	62	676	510

* Inc NGLs

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Looking at the world's key supply region, which contributes about 25% of oil supply, its oil reserves are not well understood. The table above shows my calculations for producing reserves in the Gulf and for the whole of OPEC, based on various depletion rate assumptions. For instance, if the current rate of Gulf OPEC production at 7.7 Gb pa represents a depletion rate for developed reserves of 4% pa, then the remaining reserves are 192 Gb, and so on. Add to this an estimate of proven but undeveloped reserves, plus a guess at what oil is yet to find and you arrive at a low case of 395 Gb of oil under OPEC's control in the Persian Gulf. This number compares with some estimates of as high as 700 Gb of oil.

Looking forward, demand will be reduced by the impact of multiple technologies for alternative energy and efficient use of hydrocarbons.

By extrapolation from the performance of individual oil fields to vast oil provinces, the ultimate conclusion is that, no matter what we do, peak production of oil from this planet is upon us.

Demand Determinants

- Elasticity of demand (price/volume) & the Energy Intensity of economies
- Rate of economic growth/growth of industrial production
- Substitution and conservation
 - Coal
 - Gas
 - Nuclear
 - Renewables & technology

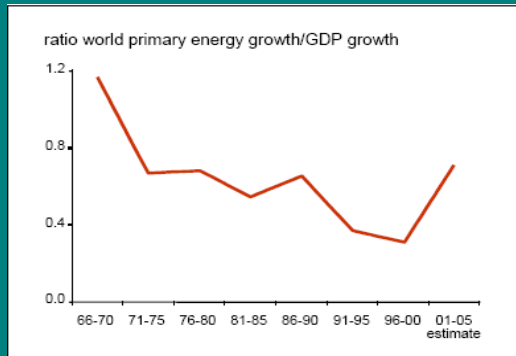
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Having made these conclusions, let me return firstly to demand, because this is the easier function to understand!

Like any economic factor input, the demand for oil varies as its price alters. There is a strong and proven relationship between the rate of industrial production growth and the use of oil. Following the massive price rises of the 1970's, global oil demand actually declined in the early 1980's as Japan switched from oil to coal and nuclear energy for power generation and Americans began driving more fuel efficient vehicles (if only for a few years!)

Energy Intensity



Source : Shell

- Energy Intensity has fallen
- Recent rise, result of lower real oil price and growth of industrialising nations
- Response to higher energy price will be a reduction of intensity

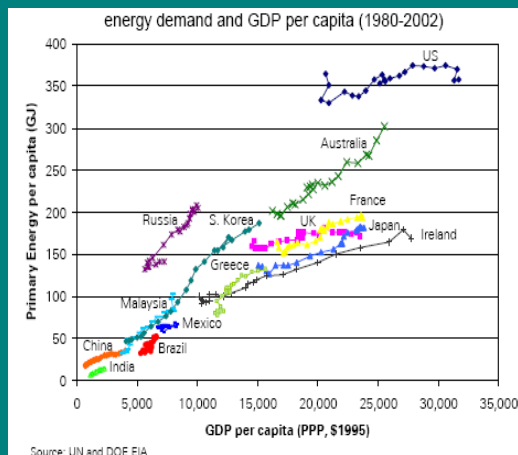
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This graph from Shell, illustrates the point that the intensity of energy use in global economies has fallen since the oil price rises of the 1970's, but that lower real prices in the late 1990's, combined with the rise of newly industrialising nations, has led to an increased energy intensity.

StockAnalysis expects that a rising oil price will reduce this usage intensity, so that in the future, rising economic growth will not require as much growth in primary energy to fuel that expansion.

Energy Demand vs GDP



- Clear trend of use as wealth rises
- USA vs Europe & Japan!
- Reversal of Russia & Australia
- China, India & Brazil at the bottom of the rung!

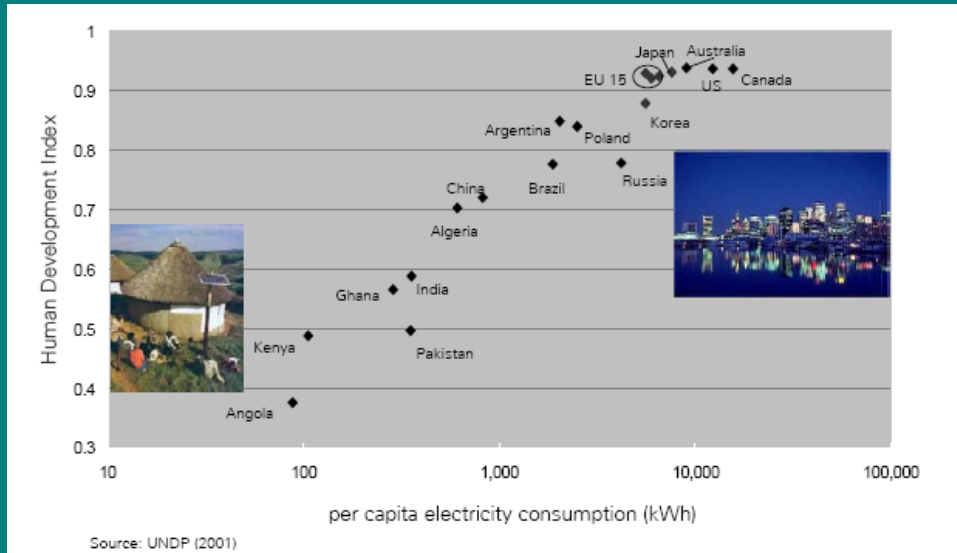
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Again, the data illustrates higher use of energy as nations become more wealthy.

If we are looking to point the finger at who is using up all our energy and increasing prices for the rest of us, it is interesting to note how much energy is used by the USA compared with other Nations which have a similar GDP per capita, such as Japan and Western Europe, where a more efficient pricing mechanism, combined with legislation seems to make these economies more efficient. The lesson for the future on this graphic, is the position of China, Brazil and India, whose combined demand for energy is bound to grow relative to other countries as they expand their economies.

Further Illustration of Energy Use vs Development



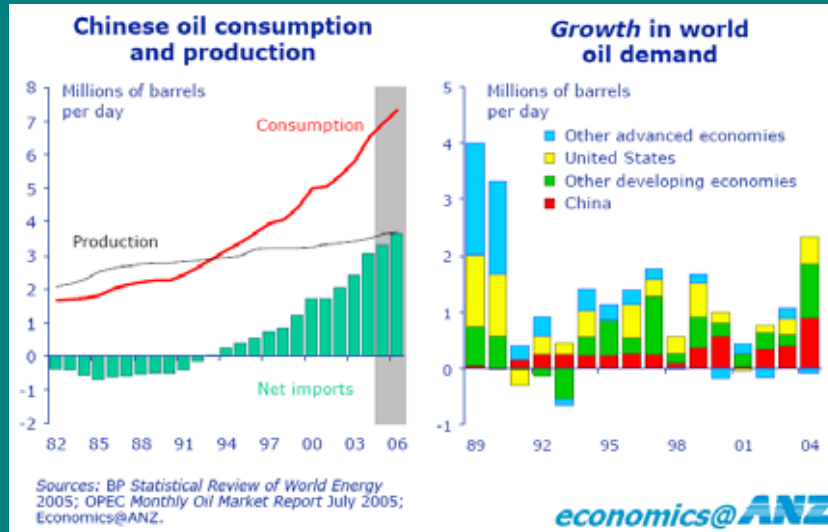
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This graph simply shows an additional measure of energy consumption vs wealth.

Note the log scale for per capita power consumption, again showing our friends in the USA and Canada leading the charge, with Australia not far behind.

Demand Growth From China



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Focusing now on China.

The ANZ Bank has compiled figures which show that after the Asian economic slowdown of 1989/90, the bulk of growth in global demand for oil has arisen from China and other developing nations, with most advanced economies, other than the USA of course, being either neutral or reducing demand.

Since 1994, China has been a net importer of oil and despite increasing its domestic production, now imports over 3.3 MBOPD.

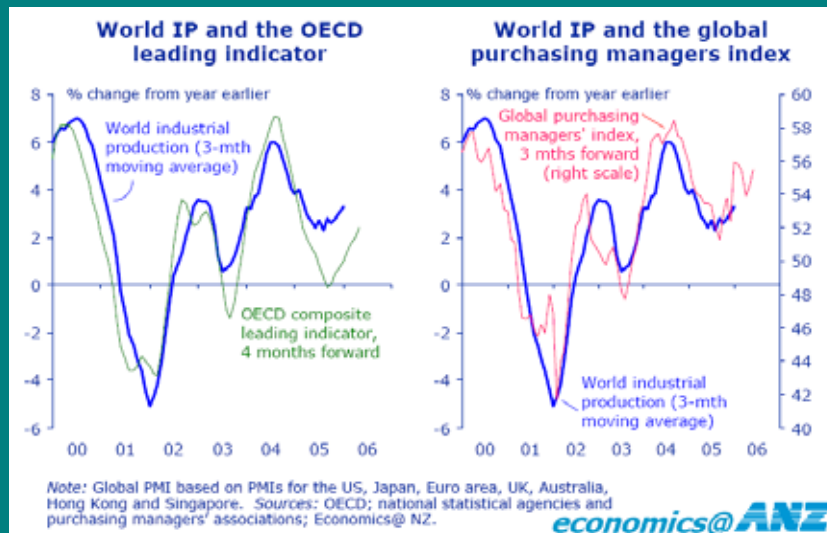
Chinese Oil Imports vs Production



Source: Simmons & Company International & IEA
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This work from Simmons & Company International also illustrates how China's oil imports have risen faster than its domestic production.

Economic Indicators



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What of the future economic environment?

The ANZ Bank tells us that everything looks rosy.

OECD leading economic indicators are rising, as are industrial production and the purchasing manager's index.

The lags associated with these indicators are often hard to estimate. I believe that the effects of 3 years of higher energy prices are likely to be felt into 2007 and economic instability, associated with the USA's twin deficits, slowing economic growth and an eventually weakening US\$ are likely to take a toll, leading to slower global economic growth and some moderation in demand growth for oil in the short to medium term.

Supply Issues

- A very political commodity
 - Supply affected by wars, weather, strikes
- Not produced where it is consumed
- Transported via Straits of Hormuz, Malacca, Panama, Suez, etc
- Reserves not well understood
- Lack of E&P spending past 15 years

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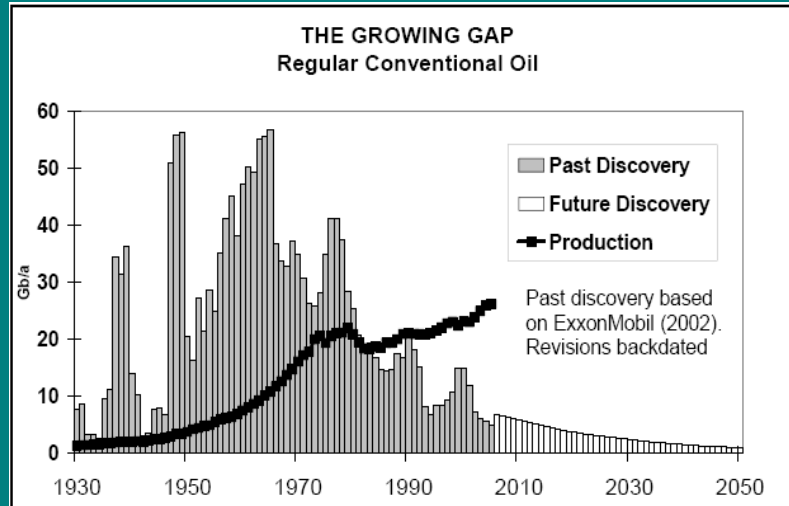
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So now to the really tricky issue of oil supply.

Oil is no ordinary commodity like wheat or copper. Over the past 50 years, it has become a critical input into modern economies but is not produced where it is consumed, it is transported through regions which are not very secure and defining reserves is more of an art than a science. Furthermore, low prices during the 1990's discouraged exploration and development of new reserves.

And the market is distorted by OPEC. If oil production capacity were to miraculously spurt ahead of demand, OPEC is always there as a cartel designed to control the market and stabilise prices. Any fall in oil demand relative to production capacity would deliver control of the oil market back to OPEC.

Key Issue for Supply



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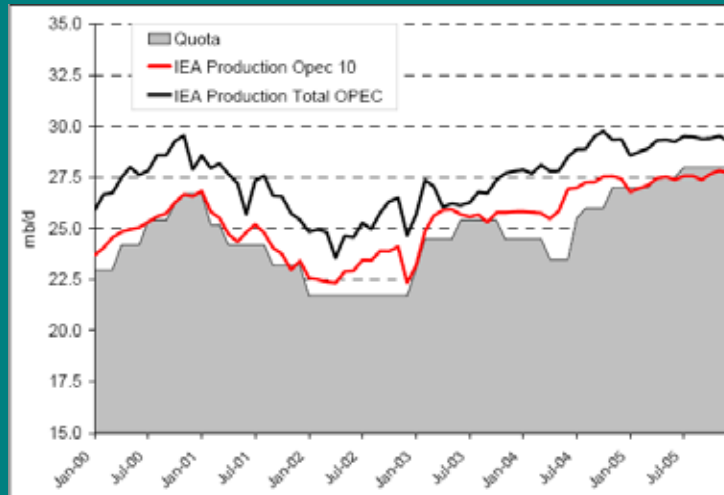
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This graphic will be familiar to most.

It illustrates the annual rate of oil discovery, with the bars showing the big discoveries of the Middle East in the 1950's and discoveries in the North Sea in the 1970's. The black line shows global oil production rising steadily, except for a pull back in the early 1980's in response to a global economic recession and a move away from oil as previously outlined.

The critical feature of this graph is that the global oil industry is now estimated to be finding about 5 Gb of oil pa while production runs at 30 Gb pa. Clearly something has to give!

OPEC Production vs Quota

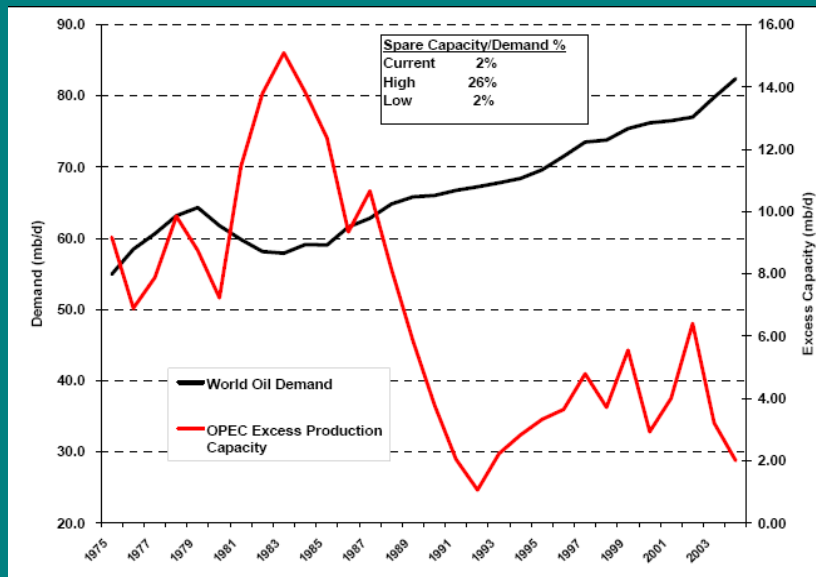


Source: Simmons & Company International & IEA
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Simmons & Co has dragged out the stats showing OPEC's production against its official production quota. This data illustrates that production is routinely 2.5-4 mmbbls per day over the official OPEC quota level but that this margin has recently declined towards 1.5 mmBOPD.

Pumps Are Running Flat Out

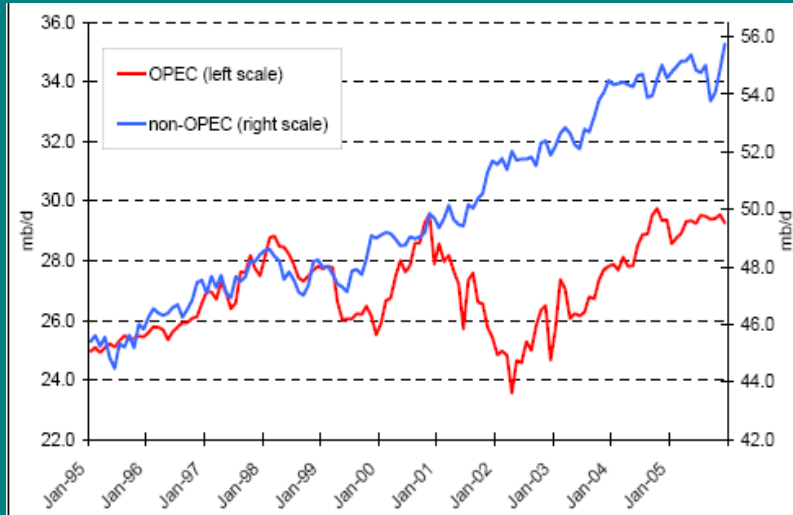


Source: Simmons & Company International & IEA Oil Pricing

OPEC's production capacity has not kept pace with demand growth. Through the 1970's and 1980's OPEC ran with spare capacity of 6 – 12 mmBOPD but this buffer has now declined to around 1.5 mmBOPD and the jury is really out on how much of this capacity can actually be operated effectively.

There are always outages for maintenance, but increasingly production goes down because of political or social turmoil, as we have recently seen in Nigeria and South America. And the production which is often out in the Gulf, is usually the heaviest, dirtiest crude for which there is limited refining capacity even if it is produced.

Non-OPEC Supply Growth



Source: Simmons & Company International & IEA
Oil Pricing

OPEC supply has stagnated over the past decade while production from Russia, Africa and Asia has filled the gap by tapping smaller reservoir pools.

What About Technology

- Doesn't create oil
- Access to greater recovery in shorter time
- Access to deep dark and distant reserves
- Difficult and unconventional reservoirs
- Oil sands and shale - at a cost

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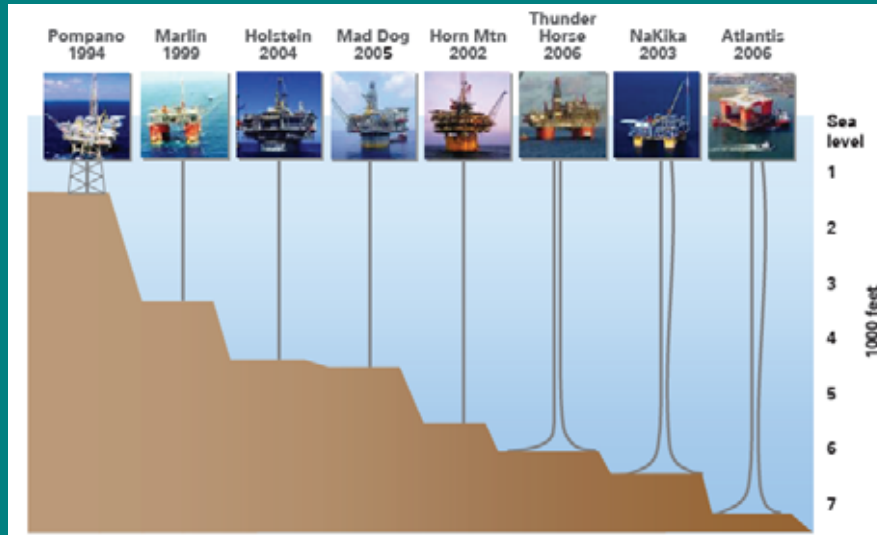
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New Technology is the great white hope.

Better drilling and well completion technology can only bring forward production. It does not create oil.

Focus is turning more to unconventional sources of petroleum products such as oil sands and shale, while big oil looks for alternatives. BP has just announced that it will spend \$500 million on bioscience initiatives with a focus on energy. StockAnalysis sees a time when canola will be priced with reference to the oil price and not as a food grain crop and wonders what this does to the world's food balance.

Impact of Technology



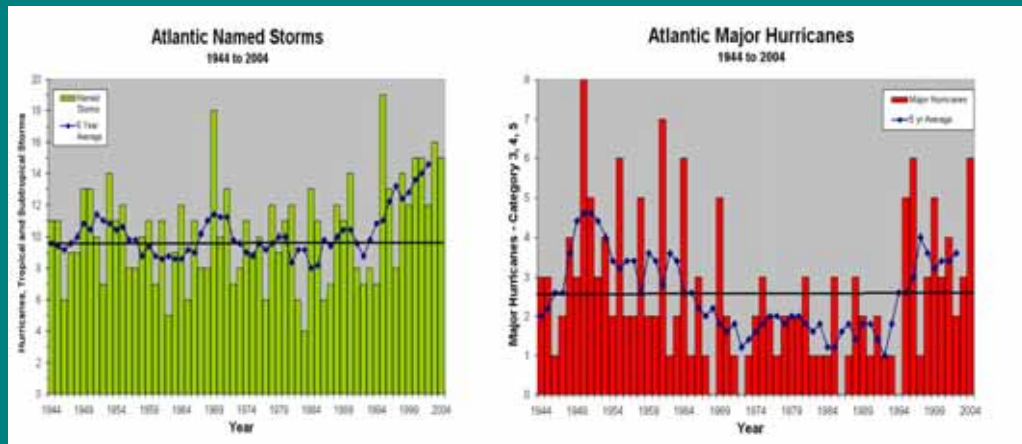
Source: BP

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BP shows how technology expands its reach, moving from production in water depths of around 400 metres in 1994, to over 2000 metres in 2006.

GOM Storm Activity



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Then there is the growing impact of global warming on the world's weather patterns.

The graph on the left shows the number of named storms each year in the north Atlantic since 1944 and the 5 year moving average. Since 1991, the number of storms has clearly increased. The chart on the right shows major hurricanes in the GOM, again showing this kick up over the past dozen years or so but also showing an active period during the 1950's.

@006 is predicted to be as active as was 2005

The Environment

- Oil men & women become meteorologists!
- Drilling windows
- Environment issues
 - Whales
 - Crayfish
 - Seismic impact
 - Oil drilling & production impact
 - Shipping lanes
 - Safe transport and delivery

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Exploration in our oceans now has more to consider. Over and above the obvious issues with weather windows, there are the environmental and infrastructure issues surrounding exploration, production and transport, which can hold up development and production.

New Oil From OPEC

OPEC Production MMBOPD	Now	2021	Depletion Rate
Proven Developed	34	27.1	1.5% pa Decline
Proven Uneveloped	0	10.0	5% pa
Yet to Find	0	3.1	5% pa
Total	34	40.2	

- OPEC production from existing fields declines
- Proven fields produce at high, 5% depletion rate
- New fields kick in ~3 MB/D
- ~40 MB/D looks tops, by 2021

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So given the impact of technology and taking into consideration the other issues, where is new oil production going to come from?

I have made a guesstimate of where OPEC's production might head. Looking out 15 years, under the best scenario I can imagine, OPEC's production will top out at 40 mmBOPD, if its existing fields can be managed to decline at just 1.5% pa. OPEC will require a huge capital injection just to hold production decline to this level.

I must point out that some credible commentators believe that OPEC is currently near its ultimate peak production level at 34 mmBOPD. Production is already declining in Nigeria and in Indonesia, which is the only member of the cartel to be a net oil importer!

Scale of OPEC's Task

OPEC Capital Cost	US\$ bn	US\$/bbl
Proven Undeveloped	1,000	\$ 5
Yet to Find	744	\$ 12
Total	1,744	
<i>Assume all PUD and YTF oil addressed over 15 year period</i>		
Per Year spend	\$ 116 Billion	
Per Day Spend	\$ 319 Million	
Chevron Capex pa	\$16 Billion pa	
	13.8% of Total Estimate	

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My estimates of the capital required, indicate that the OPEC nations will need to spend \$320 million per day or \$116 billion pa, to achieve this production target over 15 years. Just for scale, I have included Chevron's budgeted capex, which seems to justify my numbers.

	MBD	Trend % pa	Projection	
			2010	2020
Gulf OPEC	21.0	2.8%	23.4	25.5
Non Gulf OPEC	8.7	0.6%	8.9	9.4
NGLs	4.3	10.0%	5.0	5.5
Total OPEC	34.0	3.2%	37.3	40.4
Nth America	14.3	0.0%	13.7	9.8
Europe	5.5	-4.1%	4.7	2.7
Pacific	0.6	-5.2%	0.4	0.3
Russia	9.8	3.3%	11.1	12.1
Other FSU	2.3	8.8%	3.3	3.8
Asia	6.5	2.2%	7.1	6.3
Non OECD Europe	0.2	-6.3%	0.1	0.1
Latin America	4.5	3.7%	5.2	4.4
Middle East	1.8	-1.6%	1.7	1.6
Africa	4.1	9.8%	6.0	7.5
New Sources				4.0
	83.4	2.1%	90.6	92.8
Demand	83.6	1.3%	88.1	100.6
Inc			4.5	17.0
Difference	-0.2		2.4	-7.8

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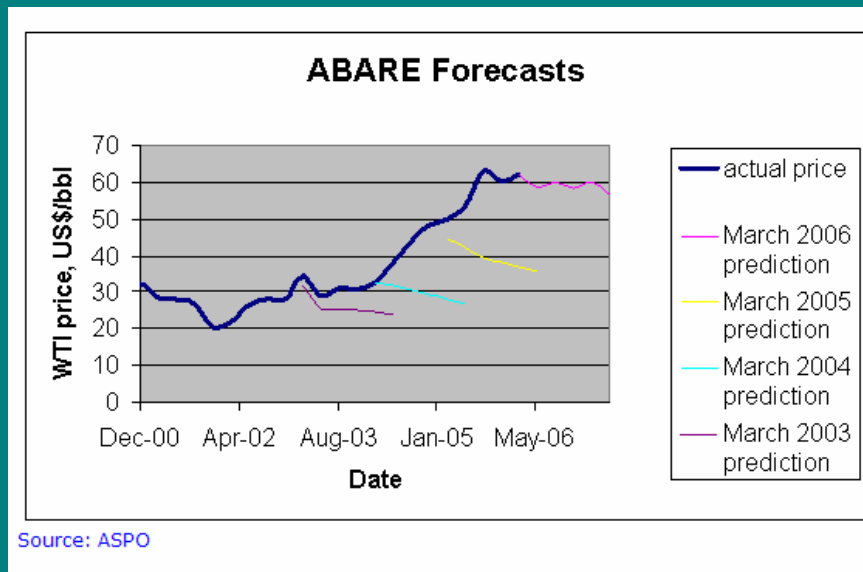
Here is the nub of the argument on the production front.

I have projected oil production out to 2010 and 2020. This work makes the bold assumptions that Iran is OK and that Iraq is OK and that Nigeria behaves and that nationalisation of oil fields in Venezuela and Bolivia does not significantly impair production. These are big asks!

It also assumes that Russia has the desire to expand production and also relies heavily on extra production from West Africa. Allowing for all these uncertainties and assuming that demand grows at a modest 1.3% pa, by 2010 world oil production will still be in balance with only a small production buffer. By 2020, even after optimistically allowing for 4 MB/d from new sources such as oil shale, production will fall about 8 MB/d short of nominal demand.

There are a lot of assumptions here about demand growth, the impact of substitution, the impact of exploration success etc, but I find it challenging to come up with a more optimistic scenario. The unavoidable conclusion from my review of the oil market is that, over the long term, the oil price will rise substantially in real terms from its present level.

ABARE's Track Record



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Here is what Australia's taxpayer funded forecasting organisation has said over the past 4 years or so. ABARE is not alone in making this kind of oil price forecast and despite all the evidence which I have put forward, ABARE continues to expect that the oil price will fall back to its long term trend. Even BP has said that higher oil prices will prevail for several years, I am at a loss to know what will spur such a massive decline in real terms.

Part of the problem in the energy industry and for energy users is that many businesses cast their capital spending budgets and investment decisions based on the word of ABARE, despite evidence that the use of a random number generator, would give a more accurate outcome!

A Word on Natural Gas

- No longer an oil man's curse
- A cleaner power generation fuel
- Still trades at half oil energy equivalence
- Supply disruptions focus attention
 - US GOM and
 - Russian supplies to Europe
- LNG transport to ensure security
- Less stranded gas

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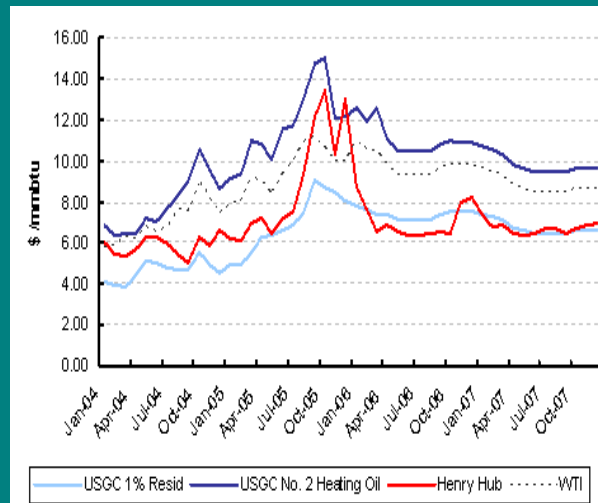
And so quickly to natural gas.

There was a time when discovering gas was a curse because there was no market for it, so it was burned while any oil or condensate was stripped out. Not so long ago, Nigeria burnt more gas each day than is used by the whole of Western Australia because it had no market. Thankfully, the establishment of a large LNG business in that country facilitates the capture of associated gas so less of it is flared.

New gas to liquids technologies, the creation of a global LNG market and the integration of pipeline networks have all served to increase the use of gas, but its price today in the most expensive jurisdictions, is still about half the price of oil on an energy equivalence basis. In Australia, the price of natural gas is equivalent to about US\$15/bbl or roughly 20% of oil on an energy equivalence basis. There is no doubt that expansion of natural gas production will continue at a pace, but down the track, peak gas will also arrive, but maybe not for 20 years or longer.

Global Gas Driven By US Pricing

- US Gas Price bounded between NO.2 diesel and Residual Fuel Oil
- Mild '05/'06 winter and record gas storage levels see Henry Hub prices dipped below US\$6/Btu



Source : Wood Mackenzie

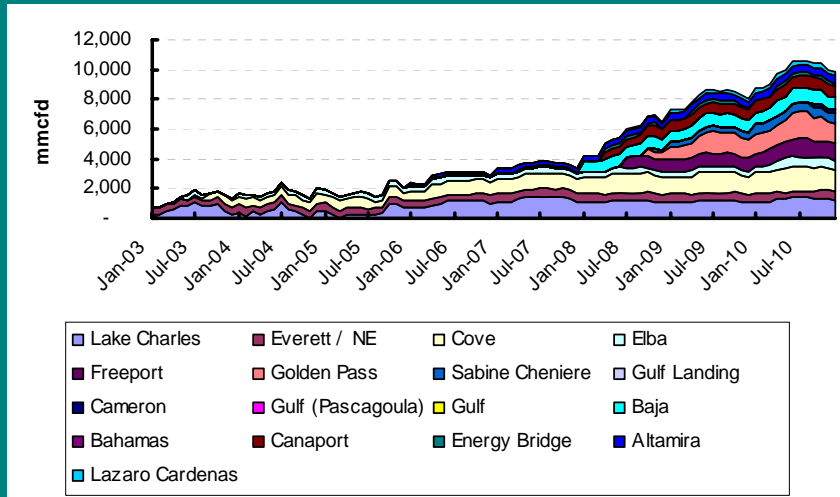
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The USA has become the gas market price setter. Its growing gas requirements will determine the global price for gas, which other players will most likely have to pay.

This work by Wood Mackenzie shows the close relationship between gas price and that for residual fuel oil. A mild winter in the USA, combined with a buildup of gas storage levels post last summer's hurricane disruptions, has pushed North American gas prices down from over US\$12/Btu to below US\$6, while Russia's move to limit supplies in Europe last year has caused huge concern about long term energy security, causing more customers to look at long term LNG supplies, largely from Africa.

Nth American LNG Imports



Source : Wood Mackenzie

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US LNG imports are set to grow from less than 730 Bcf pa to around 4 Tcf pa by 2010, and will continue to grow strongly through to 2020. Here is a Wood Mackenzie plan for import volumes through existing and planned import terminals with others in the wings.

The USA's growing appetite for natural gas, especially for power generation, along with its declining domestic production is likely to see global prices for gas rise in real terms.

Australian Gas

- Rising demand for gas to feed LNG export offering twice domestic price
- Competition from new LNG hubs will lift domestic gas price
- SE Australia, geographically insulated from LNG price push for next 10 years
- CSM producers must be looking to a higher gas priced future

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Meanwhile in Australia, the gas business is all about LNG and to a lesser extent Otway and Gippsland Basin production and coal bed methane.

The gas price on offer for the sale as LNG into lucrative Asian and North American markets, is at least twice that available for sale to domestic consumers, all you need is 4-5 Tcf of the stuff and US\$2.5 billion worth of infrastructure!

In the longer term, the establishment of LNG production and export hubs will attract third party gas and eventually lead to rising gas prices for SE Australian consumers. That will be when the CSM players will finally make some serious money.

Conclusions

- Any supply shortfall depends on political events and no spare production capacity either
- Supply to keep pace with global oil demand until 2011
- A low level of spare production capacity keeps market sensitive to short term production disruptions
- OPEC to regain market control & regulate supply to maintain steady pricing
- Post 2010, the oil price is set to rise in real terms
- Oil reserve replacement ratio has fallen well below 1
- Peak global oil production appears to be approaching within a decade

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In the short term, the supply of oil is largely dependent on political events and the weather in the Gulf of Mexico.

If everything goes well, oil supply should keep pace with demand for the medium term, especially if demand growth declines in response to swiftly rising prices and slower economic growth.

If supply outruns demand, OPEC would step back into control of the oil market and a price collapse is thus unlikely.

In the light of evidence gathered, I expect that the price of oil will rise in real terms.

Depending on political events and other exogenous influences, if most things fall into place, the world's total oil production capacity is likely to peak at about 92 million barrels of oil per day, shortly after 2010, but if there are delays or other disruptions, peak oil production may occur prior to 2010, following which a period of plateau production will follow before the onset of a secular production decline.