The Oil Drum: Europe
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Oil export - import model for the UK

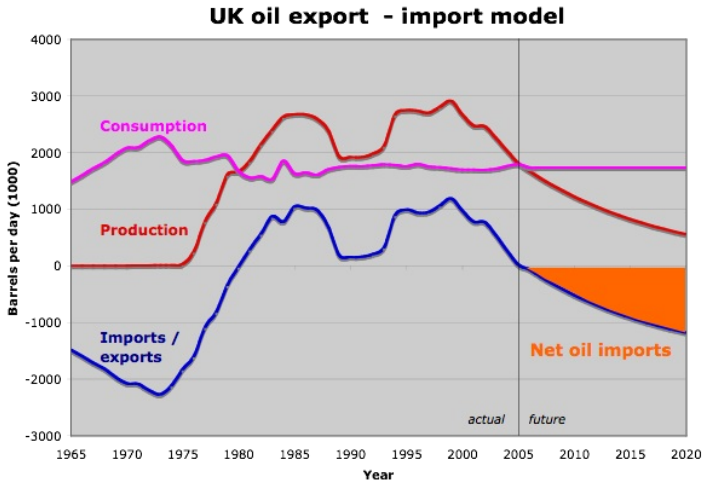
Posted by Euan Mearns on September 20, 2006 - 12:00pm in The Oil Drum: Europe
Topic: Demand/Consumption
Tags: exports, imports, oil, united kingdom [list all tags]

This post follows up on the work of Khebab and Westexas on US oil imports and the recent discussion on TOD about declining oil exports from Export Lands. In the Export Land model, the focus is on oil exports as opposed to oil production. This recognises that the economies of many oil-exporting countries are booming, e.g. Russia and the UAE, resulting in sharply increased consumption of oil by those countries and this decreases their oil export capacity.

The UK provides an interesting Export Land example because since 1980, the UK has been a net oil exporter. However, following the production peak of 1999, production has been declining at an average rate of 7.56% / year and this year the UK will change from an oil Export Land to an oil Import Land.

UK oil production, consumption, exports and imports

The historic oil production and consumption data are taken from the 2006 BP statistical review. The historic import and export data (1965 - 2005) are calculated by subtracting the oil consumption from the oil production figures. This shows that the UK became a net exporter during 1980 and the data point to the UK becoming a net importer during 2006.



UK oil production peaked in 1999 and has since gone into steep decline. Click to enlarge.

The double peak in UK oil production has compound origins. Production decline in the mid 1980s was initiated by the oil price crash of 1986 that led to the postponement of several projects. Decline was compounded by the Piper Alpha explosion in 1988, which led to lost production from the Piper hub and deferment of production in many fields whilst sub-sea safety valves were installed in the wake of the disaster. During the early 1990s several large new fields were developed (e.g. Nelson, Scott, Bruce, Miller), and this combined with postponed and deferred

"1980s" production coming back on line led to the second production peak in UK North Sea.

The situation today is very different. The only significant new field scheduled for production is Buzzard that will come on stream towards the end of 2006 at a planned rate of 200,000 to 300,000 barrels per day (bpd). Otherwise, most fields are operating at maximum and there is no spare capacity or deferred production waiting to be turned on. The decline that started in 1999, therefore, is forecast to continue.

The only area of UK waters that may contain significant, multi-billion barrel reserves that could likely arrest this decline is the deep water of the Atlantic Margin. The geological history of this area is rather different to the North Sea and it seems likely that known oil source rocks are now too deeply buried. Even if significant oil reserves were discovered here it would be many years before they could be developed. It is highly unlikely that any oil discoveries from the Atlantic Margin could arrest the decline in UK oil production within the time frame discussed here.

Production decline model

Production decline since 1999 has been rather uneven. 2002 was an anomalous good year, the result of the Elgin and Franklin fields coming on line during 2001. These fields produced at a combined rate up to 140,000 bpd during 2002 and this was sufficient to partly offset the relentless production decline seen in most other UK fields (note that DTI production figures are quoted in metres cubed per month)

2000 -8.32%
2001 -7.16%
2002 -0.53%
2003 -8.36%
2004 -10.15%
2005 -10.86%

The Buzzard Field, coming on line late 2006 should also temporarily reduce the rate of decline seen in 2007. However, with production falling near everywhere else, including Elgin, Buzzard will provide only temporary respite.

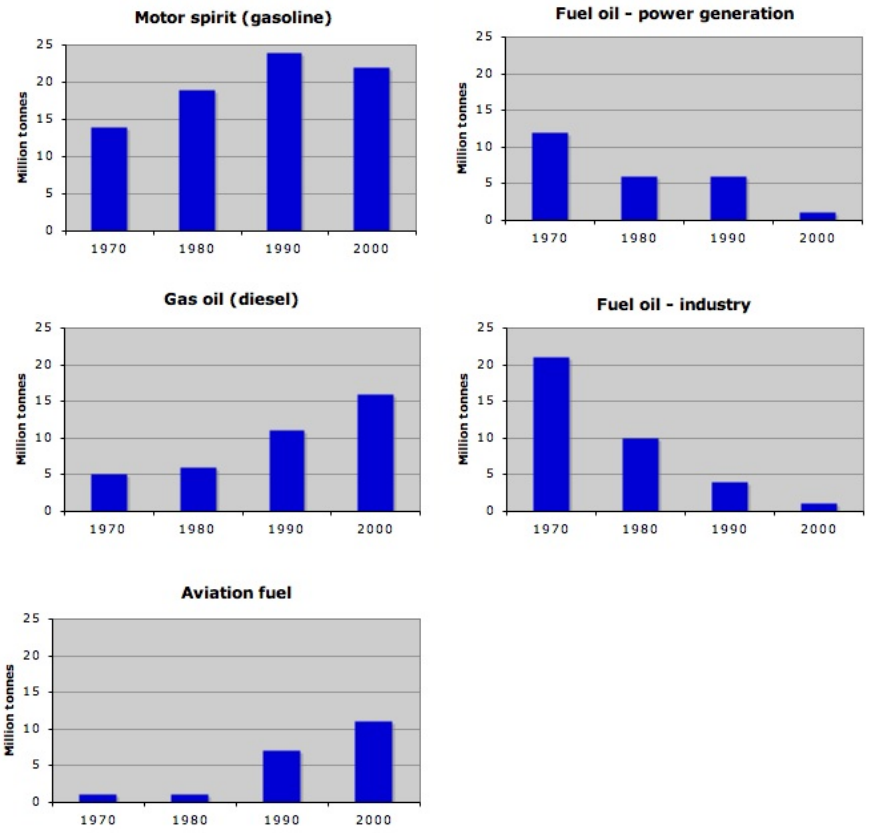
I have modelled the future decline pattern using an annual decline rate of 7.56% per year, which is the average of the 2000 to 2005.

However, data published by the DTI for 2006 production, suggest that decline may be accelerating. In the period Jan-May 2006, the UK offshore fields produced crude oil at a rate of 1.53 million bpd compared with 1.76 million bpd in the same period of 2005. This represents a 13% production decline.

Given that decline in 2004 and 2005 was >10% per year and decline so far this year is around 13%, the decline figure used here may prove to be over cautious.

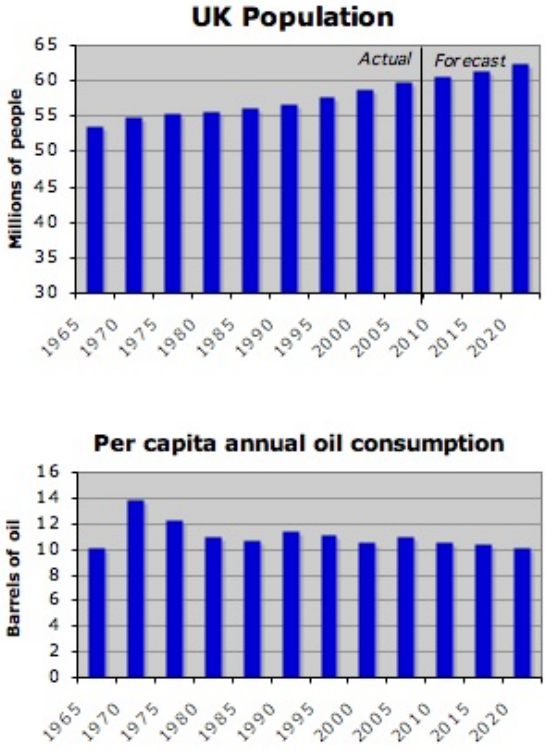
Consumption forecast model

The oil shocks of 1973 and 1979 led to a change in oil consumption patterns in the UK. The use of fuel oil in electricity generation and for industrial use went into sharp decline. These uses have now declined to virtually zero - and cannot decline much further. This decline was largely compensated by sharply increased use of oil in transportation - gasoline, diesel and aviation fuel. Use of diesel and aviation fuel is still rising.



UK oil consumption. Use of oil for transportation is rising while use of fuel oil in power generation and industry is falling. Click to enlarge.

These compensatory trends have resulted in UK oil consumption staying fairly constant in the period 1980 to the present day. The UK population is rising slowly at a rate of about 0.3% per year and per capita use of oil has been virtually flat since 1980 at around 10.9 bbls per capita per year.



UK population is rising slowly and per capita use of oil has been flat since 1980

It is envisaged that increased migration from Eastern Europe combined with increasing use of oil for transportation will apply upwards pressure on future oil consumption and that this may be balanced by downwards pressure caused by higher prices. This may be an over-simplification but this will be the subject of another article.

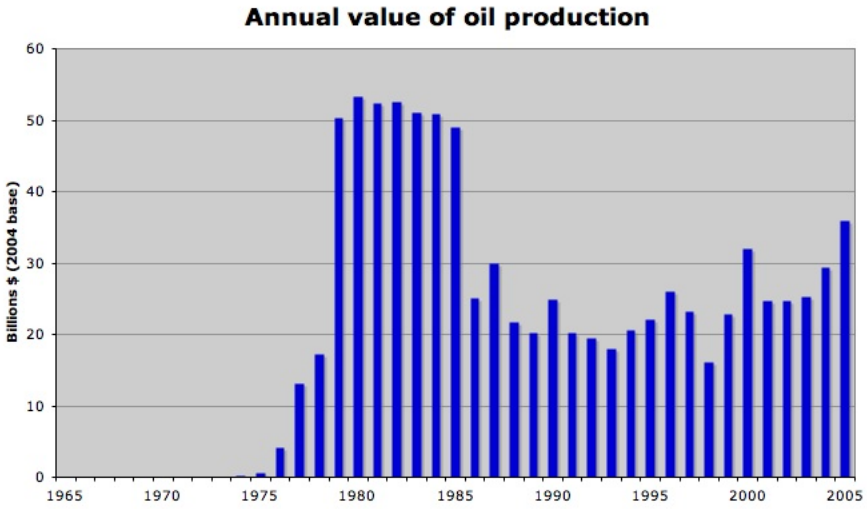
Thus the flat trend of oil consumption since 1980 is forecast to continue (unless there is a radical change in price and government policy) and the average consumption figure for the last 10 years of 1.74 million bpd is used in the consumption forecast model resulting in a slow decline in per capita consumption as the population rises.

Implications for oil imports / exports and the UK trade balance

The export / import model shows the UK becoming a significant net oil importer in the coming years. Five years ago (2000) the UK exported 970,000 bpd. In 5 years time (2010) the UK may be importing around 500,000 bpd - a swing of almost 1.5 million barrels per day in one decade.

The data plots showing the value of production, imports and exports use the annual average dated Brent spot prices given in the BP statistical review as denominated in 2004 $US. This may be an over simplified picture as not all oil will be traded against this benchmark. But the general conclusions will be valid.

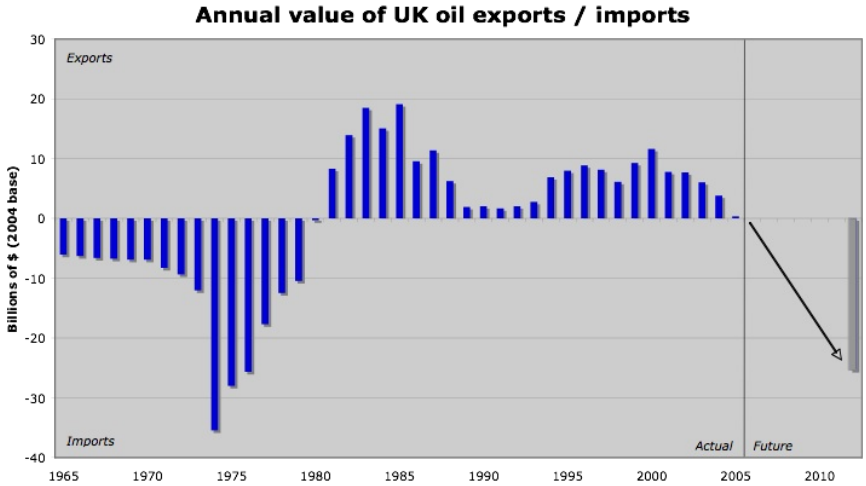
The value of UK oil production peaked in the period 1978 to 1985 (based in 2004 $). Production values collapsed in 1986 as a result of sharply lower oil prices.



The $ value of UK oil production peaked in the early 1980s. Recent high prices have been largely compensated by falling production. Click to enlarge.

Declining production has to a large extent offset the high prices of recent years, though 2005 was the highest value year since the price collapse of 1986 (based in 2004 $).

In terms of export values, the UK has enjoyed a $ trade surplus from oil exports since 1981. By 2005, however, this surplus had all but disappeared and declining production in future, leading to oil imports will see a significant net trade deficit emerge from oil purchases. I have refrained from attempting to forecast the size of this deficit, as this will be dependent upon the future price of oil. However, for illustrative purposes only, assuming an oil price of $100 / barrel indicates an annual oil trade deficit of $25 billion by 2012 (the grey bar).



The $ value of UK oil exports had declined to near zero in 2005. Future oil imports will weigh on the UK trade balance. Click to enlarge.

Mitigation and UK fiscal policy

It is clear from looking at the import / export model from a UK economic perspective (as opposed to an environmental perspective) that everything should be done to incentivise off shore operating companies to produce more oil. This will not arrest the decline curve, but it may lower the rate of decline.

Prudence: UK Chacelor Gordon Brown has increased taxation on UK oil producers even when faced with plumetting North Sea oil production

UK Chancellor Gordon Brown increased taxation on profits from off shore production in 2002 and again in 2005. This is a clear disincentive for companies to invest in North Sea exploration and production.

Equally, serious policies need to be introduced to reduce oil consumption. The oil demand data potentially conceal a worrying trend. In the year 2000, oil used for transportation accounted for >95% of UK oil-fuel consumption and use of oil for transportation is still rising at an alarming rate. It is no longer possible to offset this rising oil consumption by reductions elsewhere. The UK government and the opposition parties are all too keen to flaunt their green credentials. And yet, no serious attempt has been made to reduce oil use in transportation. Indeed the road network and our major airports are still being expanded. Our government needs to act to redesign our transportation network, based on CO_2 free electricity. If no action is taken, then future oil

shortages will most likely cripple our oil based transportation system.

The sensitivity of the oil import forecast to varying decline rates and oil consumption will be discussed in a follow up post, together with an examination of options for reducing dependency upon crude oil for transportation.