The Oil Drum: Europe
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

The forecasting record of CERA and other commentators

Posted by Euan Mearns on December 12, 2006 - 10:27am in The Oil Drum: Europe
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Central to the Peak Oil debate, is the ability of individuals to forecast the future, based upon information that is available to them today. Different people and organisations come up with different forecasts based on the same data. So how does anyone know who to believe?

Cambridge Energy Research Associates (CERA) in March 2006 presented a model for UK **oil production capacity** showing around 2,350,000 bpd for the UK in 2006. **That's around 700,000 bpd higher than the actual production figure.**

Where does the truth lie? A full review of CERA's and other UK oil production forecasts are dicussed under the fold.

One problem with forecasting World Peak Oil is the poor quality of data that is available from certain key areas such as the Middle East. Another problem, however, is the fact that industry professionals are able to draw quite different conclusions from the same data sets. I therefore feel that it is time to examine the forecasting records of some leading industry commentators.

Whilst there may be a fog swirling around the oil production and reserves data in certain parts of the world, this is not the case in the UK which has a comprehenisve production data set for all fields that is available on line. You may think therefore, that there might be a high degree of concordance between UK oil production forecasts for the coming years. This is not the case. Forecasts for 2008 oil production - that's just 2 years away - vary by up to 500,000 bpd.

Last week, I presented a detailed analysis of the history of UK oil production together with a forecast of future production to 2012 (Mearns2). So lets get down to the nitty gritty and see how forward production models recently presented by CERA, Kemp, Koppelaar and the UK Department of Trade and Industry compare with Mearns2 and the historic production data.

Summary of UK oil production models

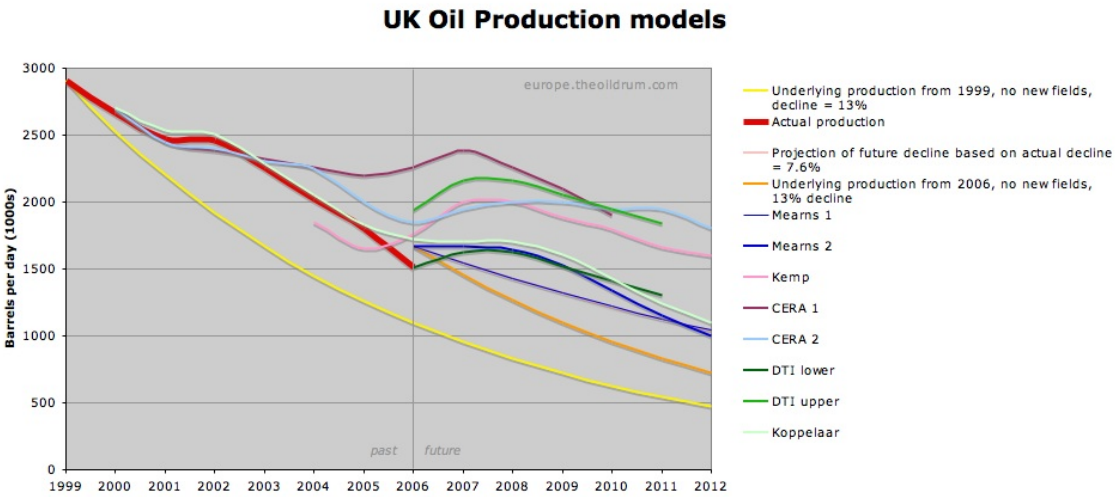

Figure 1. Oil production models and forecasts for the UK. See here for further details. Other forecasts are discussed below. Click on chart to enlarge (applies to all charts).

Figure 1 summarises oil production models for the UK. I refer to these as models as the data from CERA and Kemp are lifted from conference presentations which cannot necessarily be viewed as formal forecasts. The thick red line represents actual UK oil production (crude+condensate+NGL), BP data 1999 to 2005. The actual 2006 figure is compiled from monthly DTI figures found here and here (XL spread sheet) and include figures from January to September. The foundation of the Mearns2 forecast was discussed at length in my post last week and this is used as a benchmark against which the other forecasts are compared. It is of course possible that Mearns2 falls wide of the mark, but if you wish to query the validity of Mearns2, please read the foundation article first.

> A draft of this article was sent to Dr Peter Jackson (a Director of CERA), Professor Alex Kemp at the University of Aberdeen and to Rembrandt Koppelaar inviting them to comment. Jackson and Koppelaar responded and I have tried to incorporate their comments. Kemp did not reply.

CERA

In correspondence with Peter Jackson, he brought to my attention the fact that their UK oil forecast that was presented at the APPEX conference in London on 8th March 2006 had been revised in October and he sent me a copy (not for publication). One of the first points Jackson wanted to make was that CERA forecast "productive capacity" and not actual production.

> "we are not projecting production but productive capacity - which will be a little higher than production in most cases. In the UK production gyrates with the maintenance season and we look at capacity as being nearer the winter 'production' highs."
>
> "we include crude plus condensate and NGL's in the outlook."

And he then went on to say:

> "I agree we were optimistic about the UK and this was dealt with in our last update in October. **The UK declined rather more quickly than we expected last year** -

because of above and below ground factors."

"Overall our outlook will give a **slightly optimistic** view relative to absolute 'production' - we don't take account of some of the big (high risk) above ground risks that will impact production such as hurricanes and geopolitics -"

"Our numbers are calibrated against activity in a **very detailed** manner - for example we have a database of 400+ new projects expected onstream by 2010 and more generally we have access to IHS data. So we believe that the capacity trends we calculate are robust and that the absolute numbers are sound."

The CERA1 data are read from the chart shown in Figure 2 that was presented to the APPEX conference in a presentation titled "Factors Driving the Global Liquids Capacity Surge". The CERA2 data are read from a chart with the title **"United Kingdom - struggling to stay still"**.

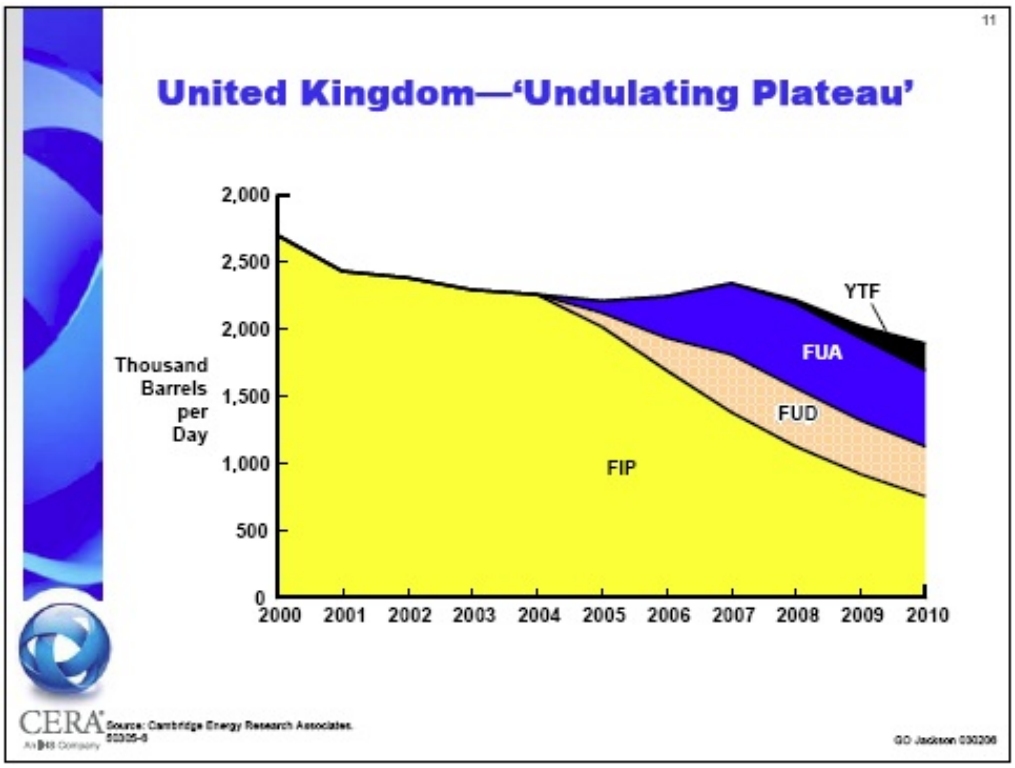

Figure 2. Oil production capacity model for the UK presented by Peter Jackson of CERA to the APEX conference in London earlier this year.

Figure 2 shows how the CERA forecasts are constructed from four basic elements:

FIP - fields in production
FUD - fields under development
FUA - fields under appraisal
YTF - yet to find

In order to disentangle all the lines shown in Figure 1, The CERA1 and 2 data are re-plotted in Figure 3.

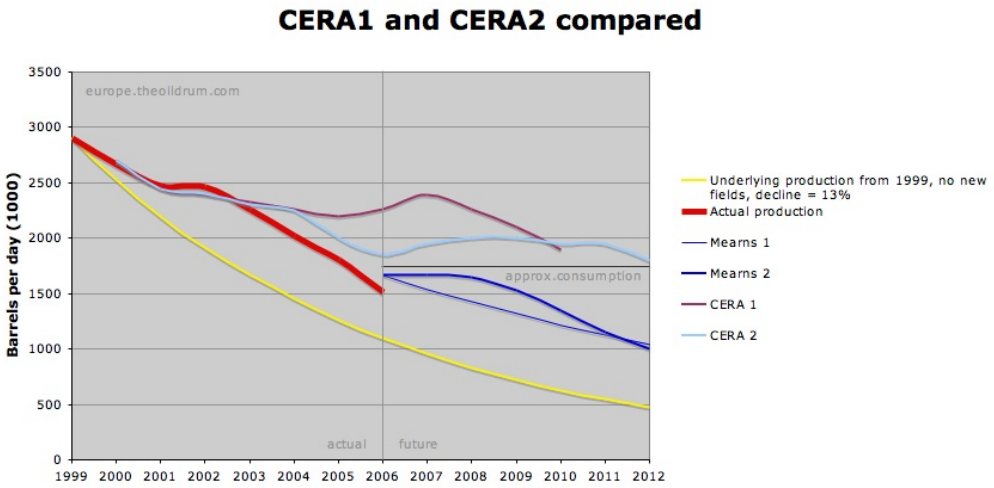

Figure 3. CERA1 and CERA2 compared. The approximate consumption line is discussed here.

Some key observations:

- CERA plot productive capacity
- The CERA1&2 productive capacity data are concordant with actual production from 2001 to 2003 but track above it from 2004
- The CERA1&2 curves are concordant with each other until 2004, thereafter they diverge significantly before converging again in 2010.
- The 2006 productive capacity figure was adjusted down from around 2,260,000 to 1,850,000 bpd between March and October this year.
- The CERA1&2 productive capacity forecasts track well above the Mearns2 forecast. By 2010 they are both around 560,000 bpd higher.
- UK daily oil consumption, discussed here, is around 1,750,000 bpd, a fundamental difference, therefore between the CERA1&2 forecasts and Merans2 is that the former project to UK oil self-sufficiency until 2010 whilst the latter points to rising imports. This is no trivial matter for the UK.

So how is it possible for CERA and I to reach such different conclusions? CERA no doubt may point to the detail and "400 projects" included in their forecast. The claim of "very detailed" analysis needs to be considered in the context of their March forecast being around 700,000 bpd too high for this year. CERA themselves have acknowledged this problem and have revised their forecast downwards by 18% for the current year.

In a general sense, I see three main problems with how the CERA forecasts are constructed:

1. The fields under development band runs at around 400,000 bpd in the interval 2007 to 2010 - and this is an appropriate figure. However, beyond 2010 these new fields will probably start to decline more rapidly than shown.
2. Fields under appraisal are not yet scheduled to produce oil. When they become scheduled for production they become "Fields Under Development" and should in my opinion be shown as a continuation of FUD and not stacked on top.
3. The same applies to Yet to Find. Once found, new fields will first be appraised before being developed. YTF should also in my opinion be shown as a continuation of FUD.

The CERA2 model shows around 200,000 bpd in the YTF class by 2010. This simply does not look feasible. When you consider that the already found Rosebank / Lochnager field, west of Shetland is unlikely to see first oil before 2010, it looks wholly inconceivable that 200,000 bpd of productive capacity could be built by 2010 for fields that have not yet been found.

Finally, I have a very substantial problem with the CERA2 forecast. The large downwards revision in October 2006 is in my opinion a significant step in the right direction. However, by 2010, the CERA1 and CERA2 forecasts are the same. In 2006 CERA2 has a much lower starting point than CERA1. Therefore, to reach the same point by 2010, CERA2 must be "more bullish" than CERA1.

So let's recall why CERA1 was revised downwards to CERA2 in the first place:

> "I agree we were optimistic about the UK and this was dealt with in our last update in October. The UK declined rather more quickly than we expected last year - because of above and below ground factors."

Surely, the next logical step from here is to be more bearish about future prospects - not more bullish?

I've not managed to look in detail at how CERA get from 1 to 2 but I have compared the underlying decline - that is the projection of Fields in Production - and this is shown in Figure 4. The underlying decline rate for CERA1&2 are the same up until 2005, but from that point onwards they start to diverge (remember that the data are read from charts).

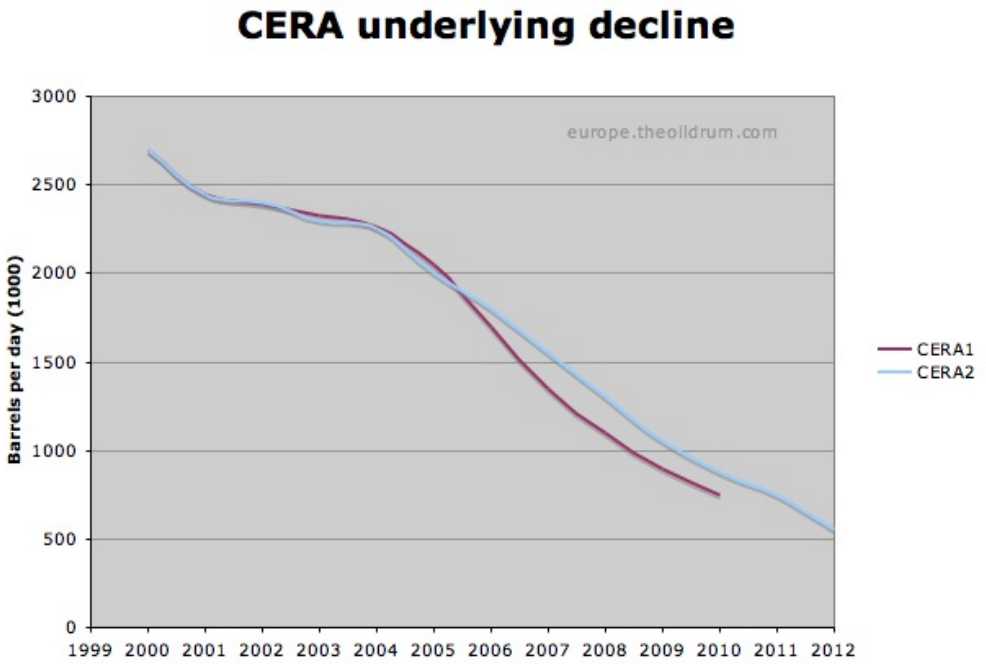

Figure 4. Comparison of the underlying rates of decline between CERA1 and CERA2. The data are read from charts.

CERA2 uses a lower rate of underlying decline than CERA1. The FUD, FUA and YTF bands in CERA1 and CERA2 look roughly the same - but these are stacked on top of a lower underlying decline rate. So, having just learned that the UK has declined more rapidly than expected, CERA then proceed to reduce and not increase the projection of that underlying decline.

Kemp

Alex Kemp is Professor of Petroleum Economics at the University of Aberdeen, and is highly respected and influential in this field. Strange then that his oil production model for 2007, is running at right angles to the oil production trend of the last six years (Figure 1). At the Oil Depletion Conference, hosted by the Energy Institute in London, November 2006, Professor Kemp presented a variety of oil, gas and total hydrocarbon models based on different economic assumptions. The one I have chosen for comparative purposes here is the $40 / bbl oil model (Figure 5) - conservative in today's terms.

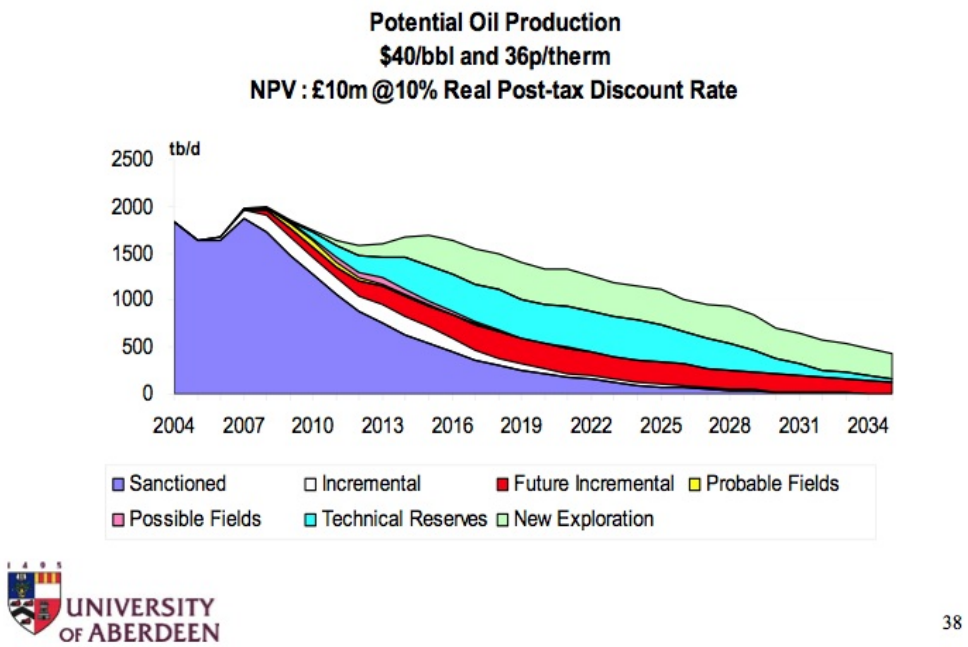

Figure 5. One of several oil production models presented by Kemp to The Oil Depletion conference in London earlier this year (pdf of presentation)

In discussion at this conference Professor Kemp dismissed what he called "single line" forecasts, referring to Hubbert linearisation and depletion analysis and scoffed at the notion of peak oil. He seemed to view the current low level of UK oil production as due to unscheduled maintenance shut downs.

What's OK with the Kemp model?

- The 2006 production number lies close to the actual figure - though as already mentioned Kemp's trend is going up, while the actual trend is going down.
- The underlying decline rate from 2009 to 2012 averages 16%, which if anything would lead to underestimation of future production.

What's wrong with the Kemp model?

- In 2004, 2005, the Kemp trend lies parallel to the actual production trend, but is displaced about 200,000 bpd below it - this looks odd.
- Kemp shows a massive reversal in the underlying decline from the actual figure which is minus 13% per annum for the last 6 years to underlying growth of +15.6% from 2006 to

2007.

- This combined with "incremental growth" points to 2007 UK production of 2.0 million bpd. This is over 300,000 bpd higher than the Mearns2 forecast and sets the scene for forward inflation of UK oil production which in my opinion is never likely to occur.

- From 2007 onwards there are multiple layers of "Potential Oil Production" such as "incremental; future incremental; technical reserves and new exploration" that are built upon the underlying decline curve. The net result is that by 2012, Kemp has 600,000 bpd more production than Mearns2 (that is 60% higher).

As already mentioned, the Kemp production line falls close to actual for 2006, and this makes it difficult to simply dismiss the Kemp model - he is after all the recognised expert in the field of UK oil and gas forecasting. And so we will need to wait a year or so to see if Kemp's model is validated.

Some of Kemp's forecasts are presented and discussed on the DTI web site and for those who are interested I have been invited to present the Mearns2 forecast to the same forum next month.

> If UK oil production comes anywhere near to 2 million bpd average in 2007 then I will accept that I have been wrong, offer my appologies to those who I have criticised and will resign as an Oil Drum contributor. This will be a clear signal that forecasts of an imminent peak in global oil production are unfounded and I will seek gainful employment else where.
>
> Euan Mearns theoildrum Dec 2006.

Koppelaar

Rembrandt Koppelaar, Chairman of ASPO Netherlands and TOD Europe contributor sent me his preliminary UK oil forecast which is shown in Figure 6.

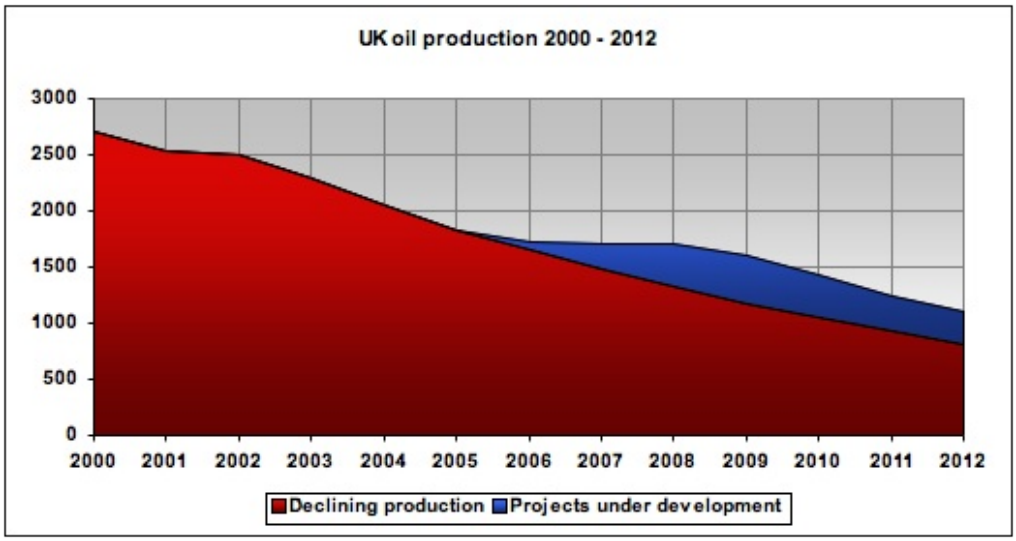

Figure 6. Forecast from Rembrandt Koppelaar. The blue slice representing new fileds under development are the same fields used to develop the Mearns2 forecast.

> Note that Koppelaars preliminary forecast has been updated since the summary chart I presented last week was prepared. The main difference is that the underlying decline

> has been raised from 9 to 11.5%.

Koppelaar's preliminary forecast falls close to, but just above Mearns2. This is not surprising since I used Koppelaars data base of new field developments to compile Mearns2. Koppelaar tracks above Mearns2 because the underlying decline rate I used was 13% as opposed to Koppelars 11.5%

There is little material difference between these two forecasts.

Department of Trade and Industry (DTI)

The DTI forecasts were the subject of an earlier post and I do not intend to go into detailed discussion here. It suffices to say that the DTI provide a forecast range that is based on data returned to them by the operating companies.

The upper forecast falls between CERA and Kemp and therefore in my opinion is a gross overestimate of what is likely to come to pass based on assessment of current data.

The lower forecast falls close to Mearns2 and not surprisngly is in my opinion rooted in the reality of oil production decline that is partialy offset by sparse new field developments.

> The $ value difference between the upper and lower DTI forecasts at $60 / bbl is $68 billion between 2006 and 2011.

Mearns2

The ink on Mearns2 is barely dry but it is already in danger of looking over-optimistic. September oil production is up from the August lows but the prospect of reaching 1.67 mmbpd in 2006, the starting point for Mearns2, is looking increasingly remote.

Several commentators (the DTI, Chris Skrebowski and Rembrandt Koppelaar) have all pointed out that the Rosebank / Lochanager project is not likely to start before 2010 - the likelihood of delays were noted in my earlier post, and this would further reduce forecast production between 2008 - 2010.

To offset possible delays with Rosebank / Lochnager, a good friend and senior industry advisor suggested that a growing number of small projects may provide a significant boost in the years ahead.

Khebab has pointed out I should use logistic and not exponential decline - next time maybe.

Hubbert linearisation

For those not familiar with Hubbert Linearisation (HL) it is a technique that uses historical production data to indicate the ultimate recoverable oil reserves (URR) for a country or sedimentary basin. This technique has been discussed at length on TOD by Khebab, Stuart Staniford and others. A brief overview is provided by Wolf at the Door.

The UK has an unusual production history with twin production peaks giving rise to two linear decline legs to the HL. The projection to URR provided by the Mearns2 and Kemp forecasts are shown in Figures 7 and 8. I have not shown the CERA2 forecast because HL is only applicable to real production and not to productive capacity. Nevertheless, performing HL on CERA2 provides a similar conclusion to Kemp.

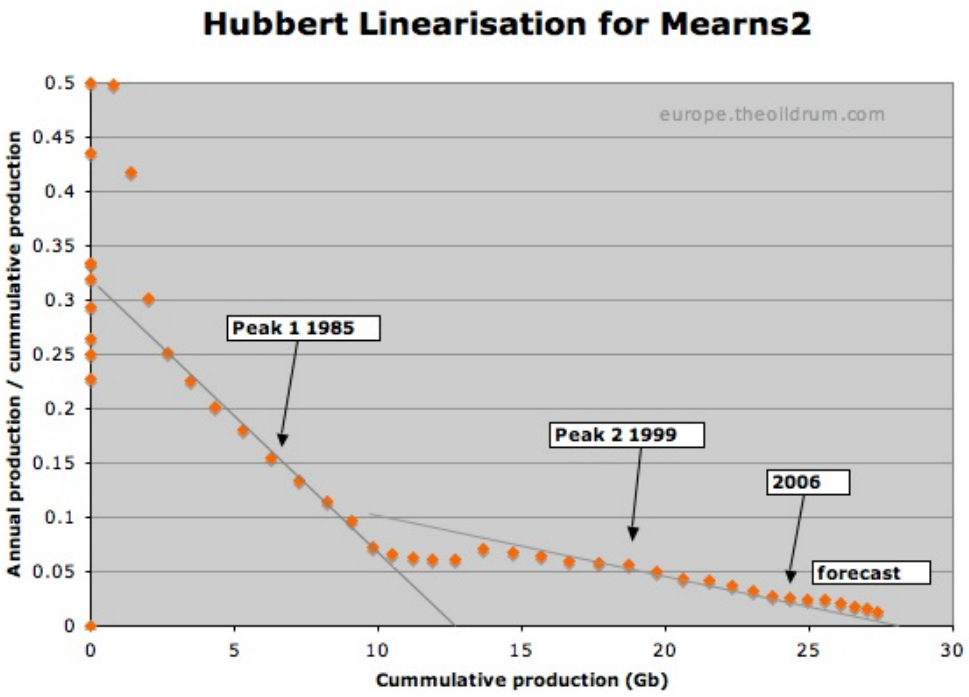

Figure 7. HL forecast for Mearns2 points to a URR above 28Gb but probably less that 30Gb

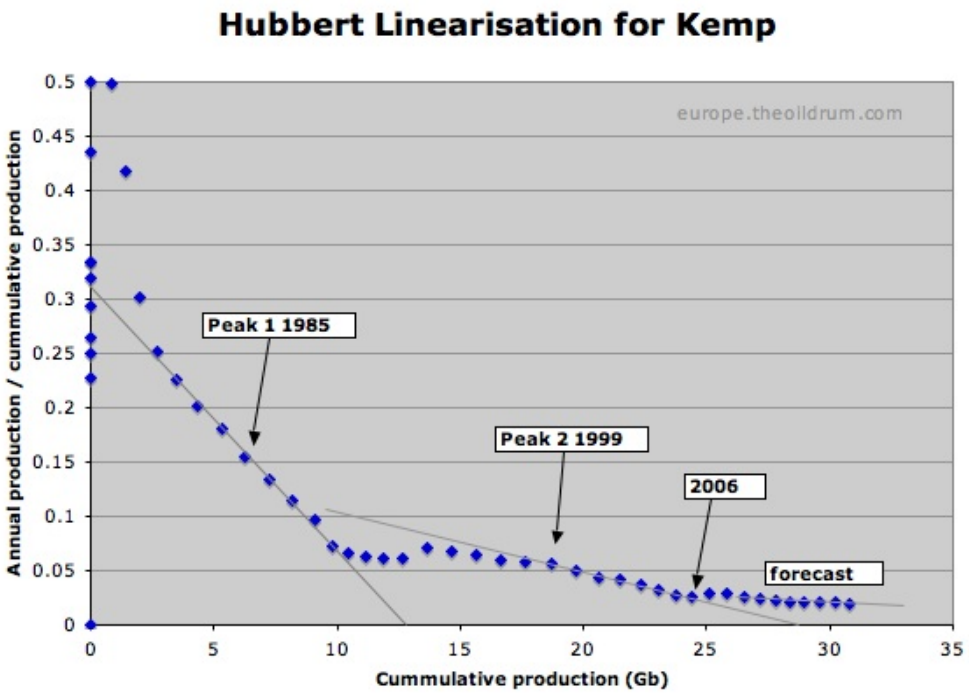

Figure 8. HL forecast for Kemp points to a URR well over 35Gb

As of the end of 2005, UK cummulative production was around 24Gb. By 2012, the Mearns2 shows cummulative production of 27.4Gb and this would suggest that the UK North Sea would be reaching the end of its productive life based on URR less than 30Gb. Kemp shows 28.4Gb cummulative production with over 7 billion barrels still to go based on URR over 35Gb.

Impact of oil price and economics

Certain observers seem to be bemused by the fact that high oil price and high activity levels in the North Sea have not managed to stem the oil production decline in the UK and Norway. They fail to recognise that high oil prices are caused by falling production in mature areas like the North Sea. In London, Kemp was keen to promote the role of economics in production forecasting. So here's a couple of economics observations.

Thanks to Nick Rouse, who pointed out here, that massive rises in oil industry expenditure over the past 5 years have by and large been swallowed by rising costs. This issue was recently covered by Dave Cohen in his post on Investment in Oil Exploration and Production - An above ground factor.

> With respect to the ability to massively increase drilling activities, this article in the Canadian Globe and Mail digs out of the biannual IEA report that the vast increase in the money invested by the international oil and gas companies over the last 5 years, $340 billion, a 70% increase, has resulted in only a 5% increase in real terms, the rest being swallowed up by inflation. This increase in drilling only yielded a 2% increase in production.

It is also important to note that since the $10 / bbl oil price lows of 1998, the UK rig count has been tracking sideways. $78 / bbl for oil earlier this year has not significantly influenced the number of drilling rigs operating in the UK North Sea.

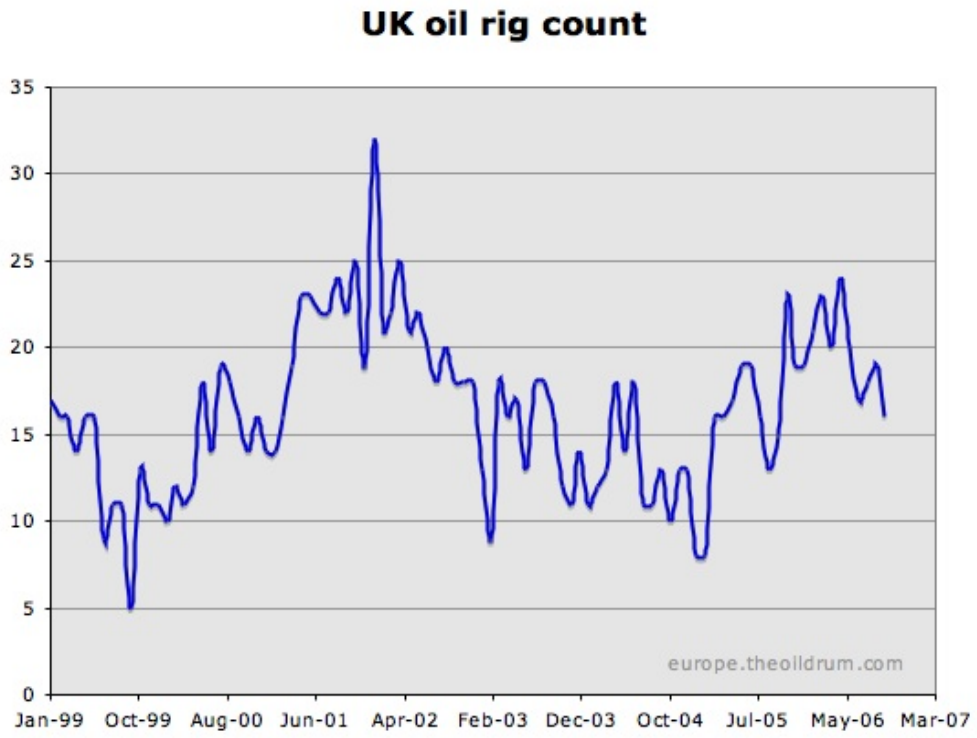

Figure 9. UK oil rig count from Baker Hughes. Since the oil price low of 1998, the number of oil rigs operating in the North Sea has been tracking sideways

The reason for this I believe is straightforward. The oil price is high everywhere, the UK and Norway are past peak production, and oil companies are drawn to areas where both exploration and production growth prospects are better than in the North Sea. In this respect, high oil prices

may in fact have worked against the North Sea, with new rigs being attracted to more prospective areas while oil prices and drilling costs have soared.

Decommissioning

Finally, it is worth looking at this rather sobering chart from the DTI that shows planned decommissioning activity in the UK North Sea. Thanks once again to Nick Rouse for bringing this to my attention.

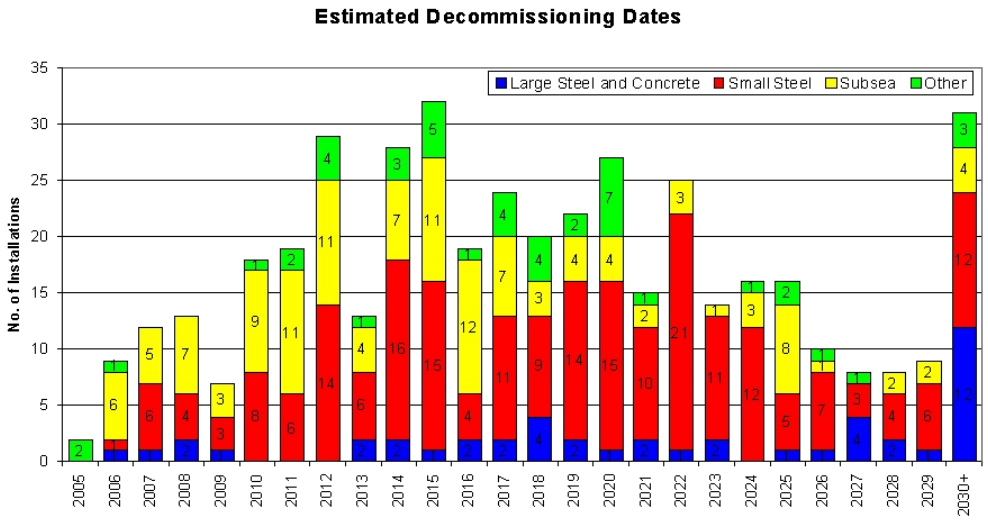

Figure 10. Decommissioning schedule for the North Sea as published by the DTI.

It has to be expected that continued high oil price may *delay* this decommissiong schedule. The emphasis here is on delay as with ageing infrastructure and falling production, the sun has begun to set on the North Sea.

Summary

The UK oil production forecasts discussed here fall into two groups. One group comprising Mearns2, Koppelaar and the "DTI lower" are very similar to each other and point to UK oil production continuing to decline in the years ahead and the UK importing increasing amounts of oil.

The other group comprising CERA2, Kemp and the "DTI upper", sees UK oil production increasing in the years ahead and the UK remaining more or less self sufficient in oil.

One final comment from Peter Jackson

> "anyone who thinks they can get this kind of work accurate to +/-50kbd is dreaming and when you go out 5 years there are so many variables that a deteministic approach has to be couched in a description of the uncertainties"

I happen to agree with that, there are many uncertainties in this world today. I will nevertheless revisit this subject around every 6 months to see how the various forecasts stand the test of time.

Euan Mearns
TOD Europe Contributor

I'd like to thank Peter jackson and Rembrandt Koppelaar for providing helpful comments and background information.