

## The price of oil should be no surprise

Dr Roger Bentley MEI,  
Visiting Research Fellow, Dept  
of Cybernetics, The University  
of Reading\*



The price of oil is now back in real terms at the levels of the 1970s' oil shocks. This has contributed to the current recession and the Eurozone crisis, and caught government, business and academia by surprise. But this should not have been so.

In the 1970s and early 1980s, most scientists who studied oil depletion knew that there was sufficient conventional oil for global production to continue rising until about the year 2000, before then declining. This was based on an estimated 'ultimate' of recoverable conventional oil around 2,000bn barrels and fitting a Hubbert curve to past production. These forecasts for the global conventional oil 'peak' around 2000 came from, among others, Esso, Shell, BP, the World Bank, the UN, the UK's then Department of Energy, and various academic studies.

Later, detailed consultancy studies were carried out between 1994 and 1996 by Laherrère, Perrodon, Demaison and Campbell using the Petroconsultants (now IHS CERA) database. Results were summarised in the March 1998 *Scientific American* article 'The end of cheap oil', which said: 'Barring a global recession, it seems most likely that world production of conventional oil will peak during the first decade of the 21st century.' It continued: 'Perhaps surprisingly, that prediction does not shift much even if our estimates are a few hundred billion barrels high or low.' The study also reported on the large resources of non-conventional oil that were then likely to be accessed, but relatively slowly and at fairly high cost.

### Tightness of supply

It should have come as no surprise then that, since around 2002, oil supply has become increasingly tight and the price risen correspondingly. Since 2005, global conventional oil production has been on plateau, and what Campbell terms 'regular oil' has been in decline. (Note: 'Conventional oil' excludes tar sands, Orinoco oil, shale oil, NGLs, GTLs and bio-fuels. 'Regular oil' further excludes very heavy oil, oil from >500 metres water depth, and Alaskan and other polar oil.)

What is surprising is that this impending tightness of supply was completely off the radar of most analysts. Knowledge of why oil production in regions peak and the likely date of

probable global supply difficulties had got forgotten. The explanation for this amnesia is as follows.

The total quantity of recoverable conventional oil is estimated by adding past production to proved reserves, probable reserves, yet-to-find and oil recovered as a result of anticipated improvements in technology and increases in price. However, in the 1970s many analysts took proved reserves as a valid indication of the total quantity of oil remaining. Since these reserves stood at 30 years of production, the fear was widely expressed that oil would 'run out' in 30 years or so.

But proved reserves did not decline; indeed, they continued to increase and mainstream oil analysts came to understand that proved reserves were simply inventory. Unfortunately – and here was the mistake – many of the most prominent analysts went on to conclude that the amount of oil remaining was therefore 'unknown and unknowable', and that should supply tighten, the higher price would always trigger more proved reserves, as had been the case in the past.

This mainstream view was so dominant that for many years the main forecasting institutions simply forecast demand and assumed that supply would be adequate. The mainstream view is still prevalent, with some oil executives pointing to the steady increase in global proved reserves as a sure indication that resource constraints must be far in the future. This naïve analysis overlooks two key facts. Firstly, global proved-plus-probable (2P) reserves of conventional oil, far from increasing, have been in decline for 30 years. Secondly, future production needs to take into account not only reserves, but also field decline. It is the latter, coupled with the fact that the larger fields in a basin tend to get discovered first, that drives 'mid-point peaking' in a region. (The latter unfortunately is counterintuitive, because peak occurs when reserves are still large, discovery is continuing and technology

improving recovery.)

Where are we today? The better oil forecasting agencies are now incorporating field decline into their models, although not yet purchasing the full databases of 2P reserves. There are projects in-train to bring on new fields and some fallow fields; the high price will encourage workovers, small-field tie-ins, and in-fill drilling, as happened in the US at the time of the 1970s shocks; recovery rates can increase; and the non-conventionals will take up an increasing proportion of production.

However, mankind is facing a very difficult energy transition. Not only is conventional oil seeing difficulty, but conventional gas will also do so soon, and there are significant questions over the supply of conventional coal. There are vast resources of non-conventional forms of all three fossil fuels, but each has difficult questions regarding cost and rate of access. In addition, we know that we must transition rapidly to much larger proportions of renewable energy sources, and possibly carbon capture and storage (CCS). But renewables have problems not only of cost and intermittency, but often of far too low an energy return on energy invested (EROEI), and for today's society to function requires quite a high minimum EROEI. Moreover, widely, there are naïve views of the impact of energy cost on levels of economic activity.

Overall, it seems clear that no one is doing the proper energy systems modelling to understand mankind's probable energy future. It is imperative that such modelling be done. ●

### Further reading

- Impact of oil price on some Eurozone countries – J Murray and D King, 'Oil's tipping point has passed', comment in *Nature*, Vol. 481, pp 433–435, 26 Jan. 2012.
- Past oil forecasts – R Bentley and G Boyle, 'Global oil production: forecasts and methodologies', *Environment and Planning B: Planning and Design*, Vol. 35, pp 609–626, 2008.
- Energy systems modelling – U Bardi, *The limits to growth revisited*, Springer, New York, 2011.
- EROEI and impact of energy cost on economic activity – A Hall and K Klitgaard, *Energy and the wealth of nations*, Springer, New York, 2012.
- Current oil analysis – D Strahan, 'Peakonomics – why the oil price slide is temporary', *Petroleum Review*, July 2012.

\*Roger Bentley will be speaking at the EI conference 'Breaking Europe's oil dependency: Pressures and opportunities', London, on 4 December 2012. For details, e: [vnaidu@energyinst.org](mailto:vnaidu@energyinst.org)

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