



Asking one of the less comfortable questions about our energy future...

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In my [last post](#) I talked a little about the media's normal pre-disposition to ask relatively comfortable questions about the state of oil (and natural gas) supply, with the consequence that some of the more difficult questions and those with more painful answers don't get asked very often. The painful questions take one beyond the current concerns on the ability of supply to match demand at a reasonable price, to the point where oil production can longer increase in absolute volume, and then on to the point where overall production starts to decline. It is an issue that [Euan](#) and the TOD Europe group are beginning to ably document, as they outline the problems that Europe will face. It is a point that is illustrated in the recent [post on the Megaproject update](#) by Khebab, and more specifically in the comments on that post. But what I would add to that, and ask, as a painful question, is as to whether the projection is overly optimistic.

Ken Deffeyes, who did so much to bring this current situation to our attention with his writing and books, who has said that he is no longer a prophet, but has [become a historian](#). His remark implies that the much of the debate over peak oil is perhaps over. And there I would disagree with him, because I remain critically concerned, as Euan is, that the world does not really understand the size of the problem that is approaching, and the speed of that arrival. Further the information that controls the shape of the production curve, post peak is usually derived relating to the pattern of the peak in the United States. To anticipate that the world curve will look the same, overlooks the critical difference that, at the present time, there is no satisfactory alternative fuel to satisfy demand. Thus the market imperatives to extract more oil in the immediate short term to meet needs may over-ride more rational concerns about achieving maximum ultimate recovery by producing the oil more slowly. This is a different situation than that which held over the time that the American production plot was developed, and alternate supplies of oil were available from abroad.

One of the significant concerns relates to the rate at which production decreases in mature fields. The average value has been assumed to lie at around 4 – 4.5%, and it is initially disquieting to note the comment that the [Wall Street Journal](#) recently quoted from the IEA.

Project delays averaging 12 months, coupled with global average decline of 5.2% - up from 4% last year – are the factors behind these revisions. Over 3.5 mb/d of new production will be needed each year just to hold global production steady. “Our findings highlight again the need for sustained, and indeed, increased investment both upstream

and downstream — to assure that the market is adequately supplied,” stated [IEA Executive Director Nabuo] Tanaka.

The acceleration in the decline rate is likely to continue as more horizontal wells become the norm in oil fields and as these become spent and drop out of production.

To explain why this is one should understand the difference between the [behavior](#) of vertical and [horizontal well production](#), particularly in the way that they behave as the oil in the reservoir declines under the driving waterfloods that push oil to the well and how they interact with the well. With a vertical well the water level rises slowly in the well, reducing the overall extraction length, but making that change slowly, over time. (Oil production is a function of the length of well exposure, among other things). With the horizontal well production remains relatively stable, until water reaches the horizon where the wells have been located, and then the entire well can become flooded, with an immediate and rapid drop in production.

In fields where these wells dominate, production declines of 10 – 14% have been observed, and, as horizontal wells become more common, it is towards that value that decline rates are heading in the future. These decline rates are not used in the conventional models that look at what the oil supply situation will look like over the next few years. Discussions that I have had, informally, with several people that talk about the peak oil situation have found them somewhat defensive about using the lower values of around 4.5%. It is as though, having grasped the nettle required to face the reality that oil production is peaking, that they then hesitate to look at the abyss that higher decline rates are going to bring.

That decline rates will increase is not itself news, [Andrew Gould](#) of Schlumberger was talking of 8% declines as long ago as 2005.

Secondly, the industry is dealing with a phenomenon that is exaggerated by the lack of investment over the past 18 years. This phenomenon is the decline rate for the older reservoirs that form the backbone of the world’s oil production, both in and out of OPEC. An accurate average decline rate is hard to estimate, but an overall figure of 8% is not an unreasonable assumption. The maintenance required to slow the rate of decline, and increase the overall recovery, is a key element of the supply picture going forward.

While I don’t think he was alluding in any way to the increasing use of horizontal wells, his number, and his position giving him more than most the sense of accuracy of the number is a recognition of the change to come.

Unfortunately, as the example of Cantarell is [demonstrating](#) when production starts to drop at around 14% it does not take long for the entire export situation for a country to [markedly change](#), which in turn will have a significant effect on those that import that oil. And yet while individual fields such as Cantarell, Yibal, and the North Sea have shown these higher decline rates are not uncommon, their impact on total world production declines has not been widely remarked. [Stuart](#) and [Khebab](#) wrote about this in complimentary pieces last November, in analyses more detailed than this. I don’t agree with some of their conclusions, but do believe that this is a critical question that requires some more detailed consideration than it is currently getting,

The evidence seems to be pointing to an overall increase in the global decline rate for existing wells. What this means is that, if world production is around 86 million barrels a day, then to replace existing declines next year, an additional new production of 4.47 mbd at 5.2% decline, instead of the 3.87 mbd required at 4.5% decline, will be needed just to stabilize supply at a fixed

level. If the rate is accelerating this difference of 600,000 bd will increase and drop the top line of the curves such as those that Khebab and others have so carefully assembled.

This increased decline rate is already being reported, and thus the potential peak in 2010 that the graph shows is already at risk and we may struggle to get much above the numbers that we are at today. Bear in mind that decline rates are cumulative over the years, and that outyear production must be that much greater to sustain supply, relative to today's production.

At present there is still considerable complacency about how the oil supply situation will play out. There is an implication that this is just a difficult period to get through, and that, in a relatively short time the situation will get better. Sadly I would suggest that even our current thinking here is largely overly optimistic, and that instead it is going to be much more difficult, faster than we expect. But also, in light of peoples' expectations about oil really being there at a reasonable price, the greater the dangers of civil unrest, as it occurs without proper public education as to the reason that "there is no more" signs start to spring up at gas stations.



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