The Oil Drum: Europe

DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

How to Address Contrarian Arguments - part I

Posted by Luis de Sousa on November 23, 2006 - 1:50pm in The Oil Drum: Europe
Topic: Miscellaneous
Tags: desilusion, gompertz curve, hubbert curve, logistic, peak oil, verhulst curve
[list all tags]

When the Oil Exports article was published here at TOD, profG was kind enough to disseminate it through out the blog-sphere, posting it at places such as SlashDot. I was very curious and went there to see the folks' comments.

Most commentators simply dismissed Peak Oil as a possibility. My first reaction was of nausea, I just couldn't believe it; these people are completely delusional. With so many people thinking like this, will we ever be able to change something, to have some kind of impact?

Then I thought I could make something good of it, because that thread had the value of being a collection of the main contrarian arguments against our message.

This is the first of a series of posts where I'll analyze the kind of contrarian arguments seen there and how to address them.

The dreaming city

If you ever read Michael Moorcock you'll probably know of Imrryr the dreaming city. Imrryr was a major city port, the center of a mighty empire, where people attained such dominance and power that they were always drugged (dreaming) in completely disconnection with reality. The dreaming was so grave that they just failed to see the end of the empire and the city, brought by the emperor himself. The folk commenting at SlashDot surely looked like Imrryrians at the edge of time.

People do not face reality. In our immense affluence and well being we just turn on the TV and let those images flood our brain without questioning it, without saying "is that so?" The Media just throw it at us without a second thought without a rebate. Remember that more than 50% of the Americans believe that Saddam Hussein was responsible for 9/11. Most of these comments got at SlashDot are based on the common sense got from the same MSM that created those beliefs. You know, at the edge of time...

There's a Peak coming

Ah! November, the month of sweet chestnut harvest, and of new wine tasting! Now, you love sweet chestnuts and on St. Martins' day you buy a hundred of them. On that day you just eat one, properly roasted on dried pine needles. But it's so tasty and sweet that on the next day you have two; on the third your mouth is watering and you have four. You go on like that until you've finished the hundred bundle. Then in your immense unhappiness you look back and see that there was a day when you ate more than on all of the other days

- Peak Sweet Chestnut Day.

This small parable is just to show you a very simple (and quite obvious) fact: a Peak is a mathematical result of growing consumption of a finite resource. Nothing can change that, even if you think that Oil is abiotic in nature (this issue will be dealt with in a subsequent post).

Peak Oil also brings with it the concept of peak occurring around the point in time where half of the recoverable resource is extracted. In our first parable this isn't the case, nothing stops you from eating more sweet chestnuts every day, until the resource isn't there. Of course your digestive system could put some restrain to that.

So it's quite common to get a question like "Why is the peak at the middle?" There's no easy direct answer besides the vague "That's how things grow in Nature." To understand the peak-in-the-middle concept we need another parable: The wood pile vs. wood land parable. You can find the hole story at [WolfAtTheDoor.org.uk](), here's the essential (homage to Paul be made - WATD improves from day to day and it still is one of the best websites I've ever surfed to, not only in content but also in design):

> **Woodpile v Woodland**
>
> Woodpile
>
> Oil production can be best understood by comparison with something such as wood. Imagine an island where there is one carpenter. The R/P ratio basis of oil usage revolves around the assumption that oil production works like a woodpile in the carpenter's backyard. Whenever he needs woods, he walks out to the pile and takes however much he requires. If things get busy and he needs more wood, he simply takes more wood from the pile. There is always enough to satisfy his needs until that fateful day when he removes the last plank and it is then all gone. The only factor in its price is demand - if fewer people want wooden things, the carpenter lowers the price to stimulate demand. If he has plenty of work on, he can increase the price and get the benefit.
>
> Comparing this with oil, if the world has 1,050 Gb of oil remaining and we use 27 Gb a year, then dividing one by the other means that we will be able to use 27 Gb of the woodpile for another 39 years. Then the yard will suddenly turn out to be empty.
>
> Woodland
>
> But oil does not sit in one huge whole in the ground, constantly being pumped out. Rather an oil field is a set of wells of different sizes, with new wells being set up as old ones dry out. The R/P ratio takes the view that the oil has already been found and is sitting patiently in the backyard. In reality, it is more like woodland than a woodpile.
>
> If we imagine instead that our carpenter had to chop down a tree every time he needed to make something, the problems become more evident. Trees vary in their size, proximity and quality. Initially our man would pick those that were large, good quality and nearby. As this was relatively easy, his prices could be kept low. But, as time went on, he would have to cut more trees of smaller sizes, travel further to find them and use wood of a lower standard. This extra work would take longer and naturally result in higher prices. Eventually, unless the trees were managed and replaced, he would find himself unable to find enough wood to satisfy his customers.
>
> But couldn't he cut the trees quicker to keep production up? He certainly could employ

someone to help him (which would be like drilling more wells) but that would result in depletion occurring more quickly, and the quicker you cut away the large and nearby trees, the quicker you have to resort to the small and distant ones. New technology can only help so much; no matter what circular saw or four-wheeled vehicle you have, there's always a certain minimum time needed to cut down and drag a tree to the workshop. Production still falls, the best you can do is change the angle of the slope on the chart. Any increase in production means a gentler initial decline and a steeper subsequent one.

Oil production works in a similar way with the important distinction that, unlike trees, we cannot replace the oil we use. It is as if every tree the carpenter cut down was gone forever.

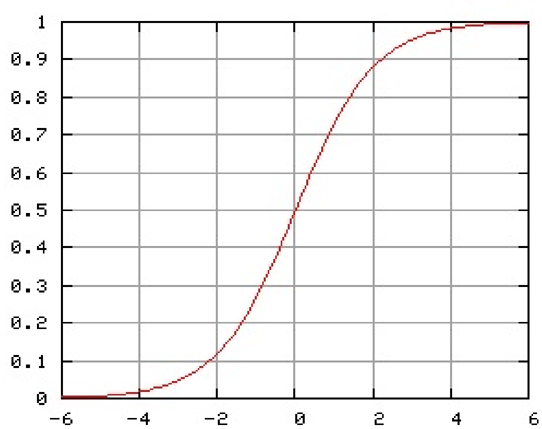
Looking at it from an EROEI perspective: as consumption grows, the resource needed to feed it also grows. Imagine Conventional Oil has an EROEI of 1 to 10, if in 2005 26 Gb where consumed, the equivalent to 2.6 Gb of past production was used to create the current rate of consumption. If you want to produce 27 Gb the next year you'll have to spend 2.7 Gb of past production to achieve it.

Like Paul explains the problem is that the biggest and closer to home trees go down first (the low hanging fruit). This tells you a very important thing: EROEI for an unevenly distributed finite resource is not static; it decreases with the amount of resource consumed.

And this is the drama, the fraction of the current harvest used to maintain and grow the future harvest starts increasing, eventually overwhelming the harvest - making it peak and decline. Going back to the previous example if EROEI felt to 1 to 5, instead of neading 2.7 Gb to get 27 Gb the next year, you would need 5.4 Gb.

Curves

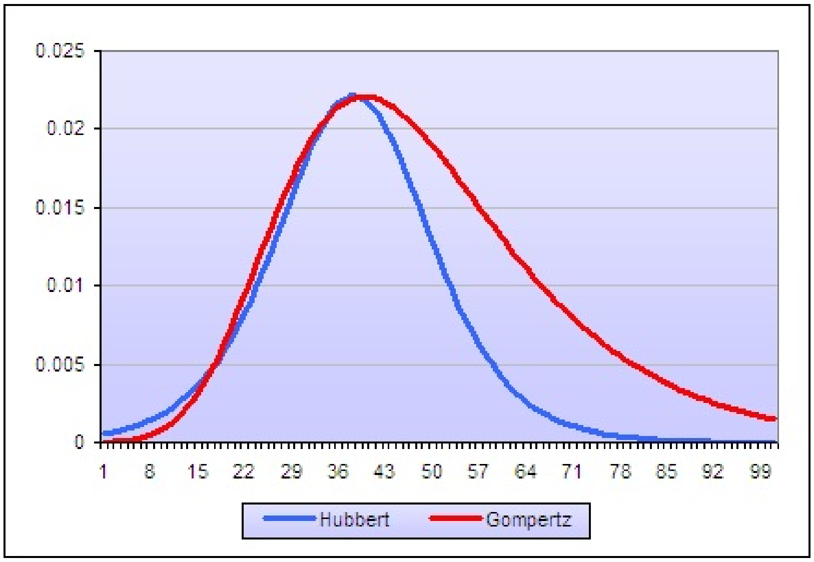
The Hubbert Curve is the first derivative of the symmetric Logistic Curve (seen here at the right). The Logistic function was formulated by Verhulst (and hence also called Verhulst curve) in the XIX century, to model population growth in Nature. The Verhulst curve gives you the cumulative growth (e.g. total oil consumed up to each point in time), whilst an Hubbertian gives you the rate of growth (e.g. the oil consumed in each point in time). The first is an S-shaped curve, the second a Bell-shaped curve. Not only in Nature, but also in Human-led events, these kind of curves model growth with success.



The Verhulst curve can have all sorts of forms with a later or sooner peak producing an asymmetric first-derivative curve. In Nature you can find different kinds of Verhulst curves each representing different environments of growth; one very common is the Gompertz Curve, which describes asymmetric growth that starts stronger and ends weaker (such was the case of cell-phone use growth).

Unconstrained growth in an environment where the resource is finite and unevenly distributed usually follows a symmetric curve, hence having an Hubbertian first derivative. I surely haven't seen any example where it happens differently.

The robustness of the Hubbert curve is its simplicity (only two parameters) making it really easy to use (Hubert Linearization). Moreover, if you are in presence of an asymmetric growth phenomenon you can still use the Hubbert curve to get an idea of when the peak will be.



An Hubbert curve can be used to find the peak epoch of an asymmetrical growth phenomenon.

Summary

A peak in consumption versus time is a mathematical result of growing consumption of a finite resource. Denying it is going against mathematics, or saying that 2 + 2 != 4.

Oil will likely present a peak at midways of depletion for it is an unevenly distributed finite resource. The "low hanging fruit" goes first - it's easier to find and maximizes profit - making EROEI decreasing with time.

The bell-shaped curves allows for the mathematical modeling of growth phenomena. Even if oil proves to yield an asymmetric bell-shape curve, modeling it with a simple symmetric curve can identify the epoch of peak.

This first post laid down some mathematical grounds for a layperson to understand that Peak Oil is a reality; in the following posts we'll deal with comments like this:

> Using energy, particularly derived from fossil fuels, is a RIGHT! Nay, an OBLIGATION!
>
> Only a terrorist or a commie pinko would think of energy usage as a cost, something to be balanced and minimized!

See ye,

Luís de Sousa (fka lads)