The Oil Drum: Europe
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Dialoguing with Dr. Peter Jackson of CERA: Is the Future of Oil Resources Secure?

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[ED by PG] Hit reddit/digg and send this to the other linkfarms fresh today, let's get Luis some more eyes for this re-post.

As a sequel to CERA's report Why the "Peak Oil" Theory Falls Down -- Myths, Legends, and the Future of Oil Resources, Dr. Peter Jackson was given a guest editorial in this month's edition of the Journal of Petroleum Technology, entitled Peak Oil Theory Could Distort Energy Policy and Debate. This article ends with this sentence:

> We invite others to join in a considered dialogue that now seems too easily lost in the rancor.

Compelled by these words some reflections follow regarding Dr. Jackson's arguments and understanding of the Hubbert's Peak.

The Title

To start, it is important to note the strangeness of the article's title; it calls Peak Oil a theory and implies it distorts the debate. Peak Oil is often labeled as a theory, usually by those not so acquainted with the study of resource depletion. A peak in time is a mathematical result of growing consumption of a finite resource; in the case of oil the peak phenomenon is already observable in more than 50 producing countries. As an oil expert Dr. Jackson surely knows this, so why call it a theory?

As for the second part of the title, it is hard to consider why the Hubbert Peak should distort the debate or energy policy. Shouldn't an open and enlightening debate consider all hypotheses? Moreover, if a peak in oil production is an observable phenomenon, why not consider as such? Take for instance the United Kingdom, can the stakeholders make the right decisions on energy policy without considering the peak in internal production in 1999?

Resources or Reserves?

After an introductory account of his points Dr. Jackson dives into his arguments, immediately producing an important affirmation:

> Our analysis finds that the remaining global oil resource base is actually 3.7 trillion bbl —three times as large as the 1.2 trillion bbl estimated by peak oil theory proponents.

Strange words, considering researchers using the Hubbert method usually do not work with 'resources', for the method produces a number for ultimate recoverable reserves. But in that case, considering the known result of Prof. Deffeyes of 1000 Gb for remaining recoverable reserves [1], and using a world mean recovery rate of 27%, the implied remaining resource is 3700 Gb, the same number Dr. Jackson puts forward.

Further down Dr. Jackson continues:

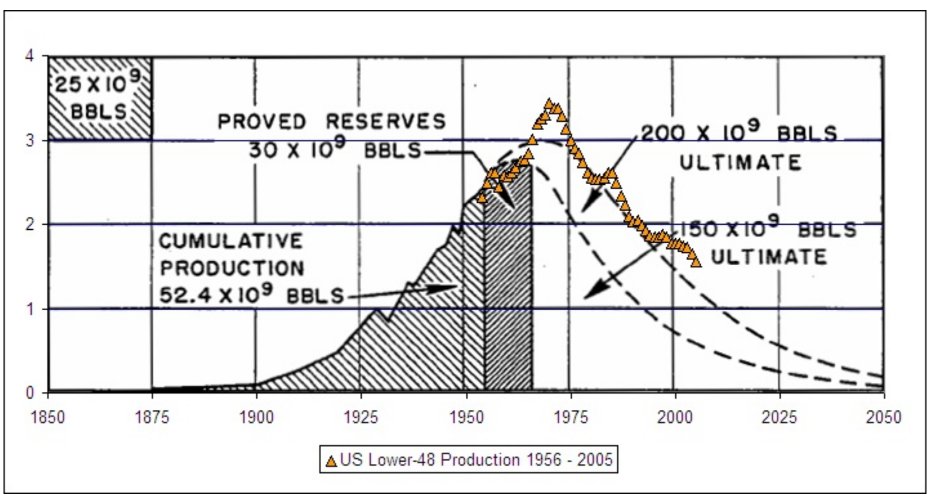
> [...] world oil production will not peak before 2030 [...]

How can world oil production peak after 2030 with a remaining resource of 3700 Gb? For that to happen the worldwide recovery rate would have to go well over 50%, something highly unlikely to happen when more than half of the world's oil fields produce less than 20 kb/d [3], and are located on ever remote regions. Such a scenario could eventually actually make the case for a fall in world mean recovery rate, not the opposite.

Before considering further arguments it is important to note that such discrepancies in Dr. Jackson's discourse seem to be caused by a mistake in conflating resources with reserves (and probably the opposite). Some clarification by Dr. Jackson on these first paragraphs of his article would be of help.

Hubbert's forecast

In Fig. 2 there's a graph representing the US Lower-48 production and Dr. Hubbert's forecast. Something is wrong with this graph, which gives the idea that Dr. Hubbert's forecast is somewhat astray from actual production. Using the graph depicted by Dr. Hubbert himself in his famous 1956 paper and the historical data published by the EIA the result is somewhat different:



M. King Hubbert's projections found in his 1956 article [Nuclear Energy and the Fossil Fuels](#) and subsequent production published by the [EIA](#).

Production didn't completely follow the curve forecast by Dr. Hubbert, but it has kept evolving close to it, sometimes below, other times above it. Differences in excess of 60%, like pointed in Dr. Jackson's article, are absent. Of note it is also a fact that using this data up to 2005, Hubbert's method continues to forecast a figure for ultimate recoverable reserves of 200 Gb.

Above ground factors

Following Dr. Jackson admits to a peak lead by above ground factors:

> An apparent peak in world oil production could appear if above-ground issues such as war, political change, or intractability in decision making by governments limit upstream investment and activity.

What is left unsaid is that these constraints arise from the fact that oil production has peaked in the countries where consumption is higher (e.g. North America, Europe). In the XXI century oil production is no longer controlled by private owned companies from large consumer countries, but mostly by state owned companies in the countries where production surpluses still exist (e.g. OPEC).

> [The] model formulated by the late M. King Hubbert fails to recognize that recoverable-reserves estimates evolve with time and are subject to significant change.

Indeed, recoverable reserves change with time. Backdated proven plus probable conventional oil reserves have been declining since the early 1980s [2].

But this focus on reserve numbers misses the main issue: oil production. A large figure for reserves or resources does not necessarily imply a higher production rate; take for instance oil shale or oil sands.

Hubbert’s method

But Dr. Jackson explains his concerns about reserves:

> Hubbert’s method requires accurate knowledge of the ultimate recoverable reserves of an area.

This is the key sentence of this article, Dr. Jackson shows he doesn’t know or doesn’t understand what the Hubbert method is. Also known as Hubbert Linearization, this method uses past production data as its sole *input*, the ultimate recoverable reserves is the *result*.

Reserve Growth

The focus on reserves continues:

> The U.S. Geological Survey, notably, points out that reserves growth accounted for 86% of total additions to reserves in the United States since 1950 and 86% of the additions to reserves in the North Sea since 1985.

These reserves additions are a well known artifact of under-reporting practices used by private owned oil companies in order to avoid taxes. This is highlighted by the fact that the reported reserves to production ratio (R/P) for the United States has been around 10 years since the 1920s [4].

This argument is itself supportive of the Hubbert method, for both the United States and the United Kingdom are countries where the Hubbert curve models production remarkably well [5].

> The fact that the method appears to work in some areas and not others suggests it is of limited use and even fundamentally flawed.

There are in fact some countries or producing areas where the Hubbert method cannot be directly applied. Such is the case when more than one discovery cycle unfolds, which eventually produces an asymmetric production curve. The political factors referenced before can also constrain production (e.g. Iran, Russia). There's no reason to think that the Hubbert method is flawed in the face of this.

Technology

> [The Hubbert method has] the underlying premise that technology is static [...]

Dr. Jackson makes the case that the Hubbert method does not take into account the technological developments that improve oil recovery. Considering again the cases of the United States and the North Sea, these were areas entirely unconstrained where better technology was readily applied for years (decades). Still they peaked; still they followed the Hubbert curve.

> Those who believe a peak is imminent tend to consider only proven remaining reserves of conventional oil, which they currently estimate at approximately 1.2 trillion bbl.

Further lack of knowledge on the Hubbert method emanates from Dr. Jackson's words. Beyond insisting that foreknowledge of existing reserves is a precondition to apply the Hubbert curve, a number of 1200 Gb is mistakenly associated with its results. As stated before, currently the Hubbert method points towards ultimate recoverable reserves of 1000 Gb (a number also given by other mathematical forecasting techniques) which is inline with current known proven plus probable reserves of around 800 Gb. This number of 1200 Gb is not associated with any known forecasting method for conventional oil.

Unconventional Oil

Dr. Jackson then addresses unconventional oil:

> Those who believe a peak is imminent [...] plays down the importance of unconventional reserves in the Canadian oil sands, the Orinoco tar belt, oil shale, and GTL projects.

So far the arguments have been made around conventional oil, for which the Hubbert method provides an important forecasting tool, as discussed above. Non-conventional oil has to be modeled separately, for it represents a new cycle in production. It too can be the subject of a Hubbert-like analysis, in which case it will yield results not very far from those presented by Dr. Jackson.

Unconventional oil is not a factor of disagreement between early and late peakers. However, there are several factors that prevent unconventional oil from having great impact on the overall production of liquid energy sources: lower recoverable reserves, lower production rates, lower net energy yields, etc. As seen in Fig. 1 provided by Dr. Jackson, it is the peak in conventional oil production that marks the end of liquids fuels production growth. If that peak comes sooner, say in the next 5 years like the mathematic models forecast, the lesser the impact unconventional oil will have.

Data

> CERA draws both on its own databases and those of its parent company IHS, which has

> the world's most complete proprietary databases on oil production and resources.

This information is quite relevant, for IHS's is also the database used by Dr. Jean Laherrère, one of the prime researchers of the Hubbert curve. It's with this same data that Dr. Laherrère arrives at a figure of 1000 Gb for remaining recoverable reserves for conventional oil, using several mathematical tools, like the Hubbert curve. Why is Dr. Jackson's CERA arriving at different results? With what forecasting tools?

> Hubbert-posited post-peak reservoir decline-curve assumptions are rebutted by observation that the geometry of typical oilfield production profiles is often distinctly asymmetrical and does not generally show a precipitous mirror-image decline in production after an apparent peak

Again Dr. Jackson shows some lack of understanding of the Hubbert method, which is not supposed to model individual field production. Also, there are no assumptions made on individual field production profiles when it is used. This is one of the strengths of the Hubbert methodology, it can be used with any underlying individual field profile. Again the United Kingdom is a good example, where individual fields tend to have highly asymmetrical profiles, with fast growth and slow decline, but the Hubbert curve can be used to effectively model the region as a whole.

> The peak argument is not presented in the context of a credible systematic evaluation of available data;

Apllying the Hubbert method to the public databases of BP, EIA or even IHS results in a short term peak. Does Dr. Jackson imply that these databases are not credible?

Methodology

> At base, their methodology is to apply decline curves against currently proven reserves and declare that the game, and the argument, is over.

With this sentence Dr. Jackson demonstrates even further his lack of understanding of what the Hubbert method is. This particular description has no relation whatsoever with the curve fitting techniques applied successfully to oil production by the late Dr. M. King Hubbert.

> Oil is too critical to the global economy to allow fear to replace careful analysis about the very real challenges with delivering liquid fuels to meet the needs of growing economies.

No one will disagree, but it is of at least the same importance to not allow optimism to replace careful analysis.

Final Comments

A short term peak in world wide conventional oil production is a result of several different mathematic techniques: the Hubbert method [1], Creaming Curve [2], Loglet analysis [6], the Generalized Bass Model [7], to name a few, using different datasets (e.g., EIA, BP, IHS, Wood Mackenzie). All these models point towards a figure for remaining recoverable reserves of 1000 Gb and a production peak for conventional oil in the next 5 to 6 years; Dr. Jean Laherrère and Prof. Kenneth Deffeyes are two of the excel figures in this area. Using accounting techniques, country by country [8] or project by project [9], other researchers arrive at similar conclusions.

Dr. Jackson simply presents a number of 3700 Gb, without further detailing the mathematical or accounting techniques used to forecast a peak in world conventional oil production beyond 2030.

As a follow up to this dialogue, Dr. Jackson is invited to learn and apply the Hubbert method to one of the available world historic production datasets.

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