



IHS Data Suggest Kuwaiti and Global Proved Oil Reserves Significantly Lower Than BP Estimates

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At the [Oil Depletion conference](#) (hosted by the [Energy Institute](#)) held in London on 7th November, Dr Kenneth Chew, a Vice President of [IHS Energy](#) reported proved and probable reserves (2P) for Kuwait of around 52 billion barrels (read from chart). This is approximately 51% of the proved reserves reported in the [BP statistical review](#) that stand at 101.5 billion barrels. This tends to support [recent reports](#) of Kuwaiti reserves being substantially overstated.

Ken Chew also presented data indicating global remaining discovered proved plus probable (2P) liquid resources of some 1,250 billion barrels. This implies global proved liquid reserves (1P) of around 950 billion barrels (based on an assumption that 1P is approximately 75% of 2P). This is substantially lower than estimates provided by BP, Oil & Gas Journal and World Oil.

This report is built around [a presentation](#) (link live until 28th Nov. 2006) made by Ken Chew, at the Oil Depletion conference held in London on 7th November and subsequent correspondence I have had with him. I would like to acknowledge that Ken has been very helpful in clarifying background information to his talk. IHS Energy own [Cambridge Energy Research Associates \(CERA\)](#) who are also leading commentators on global energy issues.

Why are Kuwaiti and Middle East (ME) oil reserve estimates important? The simple answer is that one point of view is that all ME OPEC reserves are incorrectly booked and are in fact grossly "inflated". The IHS energy data presented by Ken Chew suggests Kuwaiti and world oil reserves are significantly lower than otherwise reported in the public domain. The IHS database is one of the more widely used sources of world oil information therefore the whole world should take note. Let's start with a look at how reserves are booked and evidence for anomalous reserves booking by ME OPEC countries.

Reserves - definitions and determination

[Oil reserves](#) (pdf) are booked according to the confidence level in their existence. In very general terms:

Proved / proven (1P) need to be proven by drilling wells, with a limited amount of extrapolation allowed away from the well bore.

Probable reserves (2P) include 1P plus additional reserves that can be estimated on the basis of reasonable extrapolation further away from the well bore based on, for example, seismic, well test, pressure and a range of geological and engineering inputs.

Possible reserves (3P) include 1P plus 2P but may also include speculative additions that may be added by future drilling.

In order to prove oil reserves it is necessary to drill wells. Finding oil is not enough to prove

reserves and a wide variety of geological and engineering data is normally collected before, during and after a well is drilled in order to estimate the amount of oil that may eventually be produced. This data may include:

Seismic - used to determine the oil trap / structure volume

Wire line well logs - used to determine the proportion of reservoir to non-reservoir in the trap, the porosity of the rocks, water/oil/gas saturation levels etc.

Core analysis - used to further assess the porosity and permeability of the reservoir

Special core analysis - used to determine the wettability of the reservoir and further evaluate the water/oil/gas saturation levels.

PVT data - (pressure-volume-temperature). This is vital to determine phase relationships of the hydrocarbons in relation to depressurisation during production.

Geochemistry and physical properties of oil gas and water - gravity, viscosity, composition. Required for designing production facilities and refining.

Well test data - further test of porosity, permeability, connectivity and volume of the reservoir.

This list is not exhaustive, but serves to illustrate the type of reservoir engineering, petrophysical and geological input that is required to prove oil reserves. Proved oil reserves may be used to present an investment case to a bank, may greatly add to the market capitalisation of any company and they may underpin national economies.

A general feature of reserves estimates is that they are revised as more information about individual fields or a country's resources become available. Furthermore, once production begins, produced oil has to be deducted from reserves and any new discoveries may be added. So on a corporate or national level reserves should be adjusted annually as follows:

- Proved reserves at start of year
- Less annual production
- Plus or minus revisions
- Plus new discoveries
- Gives proved reserves at end of year

Finally oil price may impact reserves estimates as this may affect whether or not discovered oil and gas resources may be commercially exploited.

The ebb and flow of how all these factors have influenced the booked 1P reserves for the UK are illustrated below.

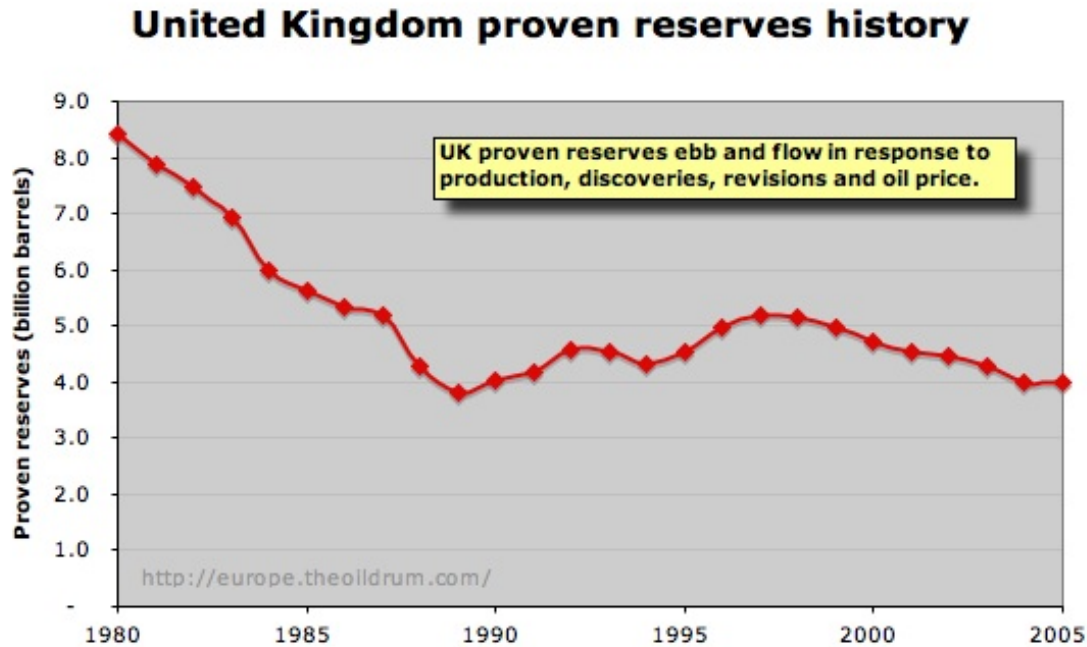


Figure 1. The history of UK proven reserves 1980 to 2005. Source [BP statistical review](#).

The ME OPEC Reserves Anomalies

Based on published data, the ME OPEC countries contain more than 50% of the World's remaining producible oil reserves. Understanding the reliability of these reserves estimates is therefore vital to the future of the oil driven growth in the World Economy.

It is then amazing to consider that the reliability of estimates for the size of this vital resource is the subject of considerable controversy and debate covered by amongst others [Stuart Staniford in earlier TOD articles](#).

The anomalous nature of ME OPEC reserves, illustrated below for Kuwait (Figure 2), can be summarised as follows:

1. Reserves were uplifted by 38% in 1984. This does not relate to any verifiable new field discoveries. If Kuwait was the only country to have done this it might be excused as rectifying a past mistake. But in the period 1984 to 1987 all of the ME OPEC countries uplifted reserves by large amounts in this period (Figure 3). For example, the UAE increased their oil reserves by 295% in 1986. One view of these anomalous revisions is that they are related to OPEC quota negotiations and are not founded on geological or engineering data.
2. Following this arbitrary uplift, reserves have more or less remained unchanged. Most significantly, no deductions have been made for production for around 20 years.

Kuwait "proven oil reserves" history

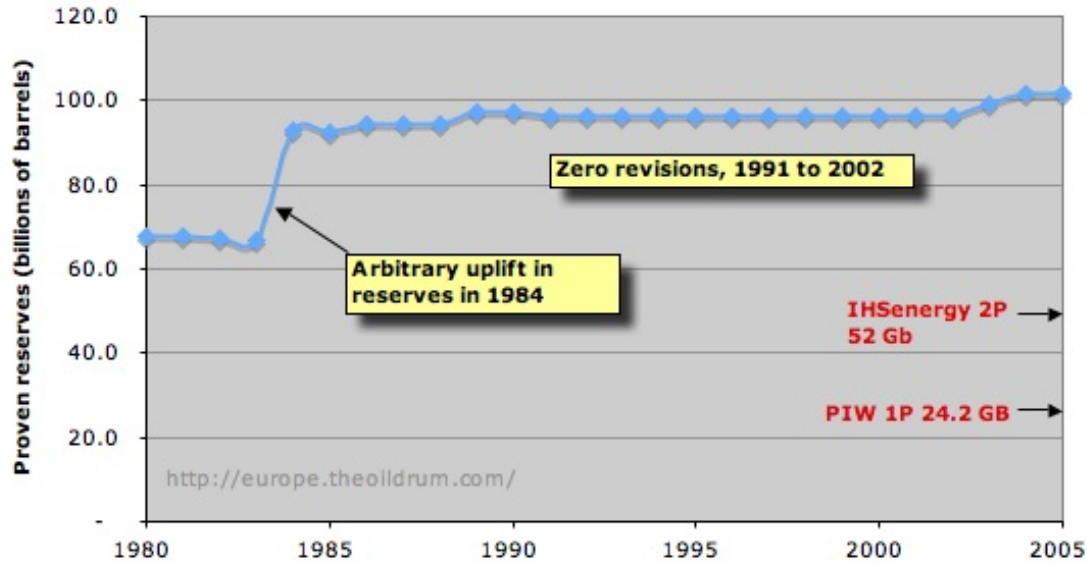


Figure 2 "Proven reserves" history for Kuwait. Source [BP statistical review](#). The Petroleum Intelligence Weekly (PIW) estimate is reported [here](#) and the IHS Energy data are discussed below.

ME OPEC - the big 5 "oil reserves" history

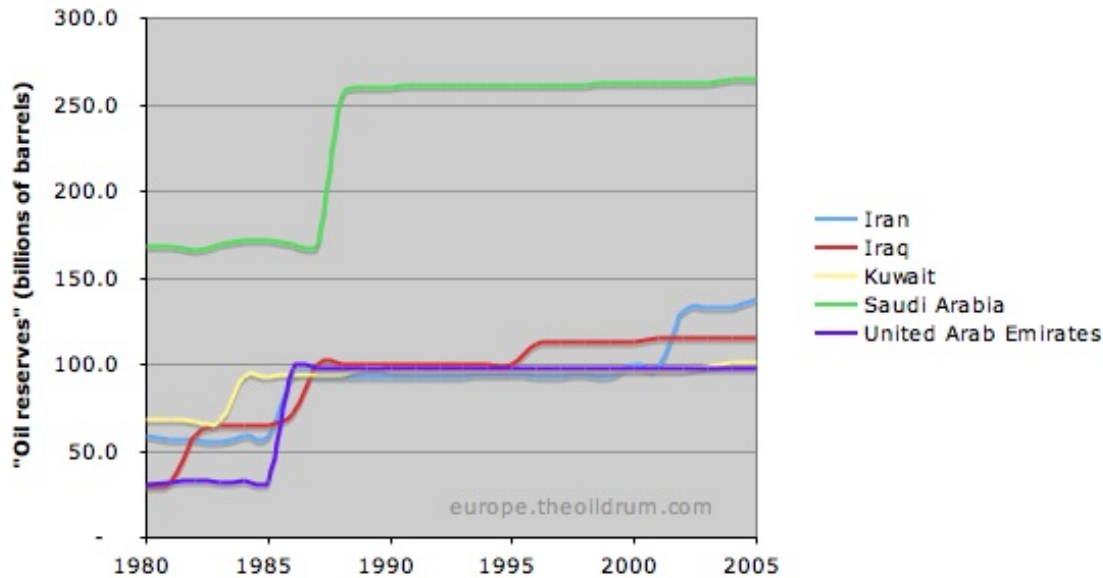


Figure 3. The Big 5 ME OPEC producers all show a similar history to Kuwait, with large arbitrary uplift in reserves during the 1980s, followed by "flat line" reserves histories lacking evidence for depletion, though additions are evident in Iran and Iraq.

It is my opinion that these two anomalous features wholly invalidate the reserves booking process. That is not to say the booked reserves are wrong - there is always the remote possibility that they are correct by chance. But this is not science and does not comply with any notion of reliable accounting that would normally be accepted within the OECD.

The fact that reputable organisations like BP report these spurious reserves figures as "Proved

"Reserves" in their annual statistical review has tended to lend respectability to the data that are accepted as fact by many observers. In particular, national governments that may want to deny that world oil reserves are depleting can point at BP as a reputable source. The reliability of ME OPEC reserves, however, is now in the public eye, and national governments are at least pressing for more transparency in resource reporting.

A View of Kuwait and ME OPEC reserves based on the IHS data

Ken Chew's presentation at the Oil Depletion conference had 37 slides crammed full of data in 30 minutes, making it difficult to absorb all that was said although all the slides were made available in a handout and a few examples are reproduced below, and these are now available [on line](#) for a limited period (link live until 28th Nov. 2006).

Ken Chew, email correspondence 10 Nov. 2006:

The whole point of my talk is that we (IHS) report 2P versus 1P (and also liquids versus oil). I don't need to mention 2P on every slide.

At the outset it is important to make clear that IHS data provide for a Low-end Estimate and a High-end estimate for global reserves as detailed below:

World liquids resources - the low-end estimate (2P)

Worldwide liquids discovered 2,328 billion barrels
Worldwide cumulative production 1,077 billion barrels
Worldwide remaining liquids 1,251 billion barrels
Worldwide liquids depletion 46.3%

World liquids resources - the high-end estimate (excluding tar sands and extra heavy oil)

Worldwide liquids discovered 3,390 billion barrels
Worldwide cumulative production 1,077 billion barrels
Worldwide remaining liquids 2,315 billion barrels
Worldwide liquids depletion 31.8%

My own opinion on the high-end estimates is that it is a gross exaggeration of what is likely to ever be recovered. One reason for stating this view is that to reach such high volumes would require development of a myriad of small accumulations in hostile environments (unless some major oil provinces have been overlooked thus far) and net energy arguments combined with lower cost alternatives that will likely become available in the medium term will mean that such a huge resource will never be extracted.

Email correspondence (dated 10 November 2006) asked specifically that the following data be posted on The Oil Drum (the data refer to ME reserves):

Here are the numbers used in the graph that compares BP Stats Review and others with IHS (billions of barrels).

IHS Energy Proved plus Probable All Liquids 678.5
 BP Statistical Review Proved Oil 742.7
 Oil and Gas Journal Proved Oil 743.7
 World Oil Proved Oil 711.9

The IHS proved plus probable all liquids number, which includes things like the condensate reserves of the North Field and South Pars, is 64 billion barrels less than the BP Stats Review proved oil-only number. For companies that report both 1P and 2P we find that 2P is generally one-third more again than 1P. Applied to the ME that would bring the IHS all liquids number down to about 510 billion barrels proved.

The following slide for Kuwaiti oil reserves was presented:

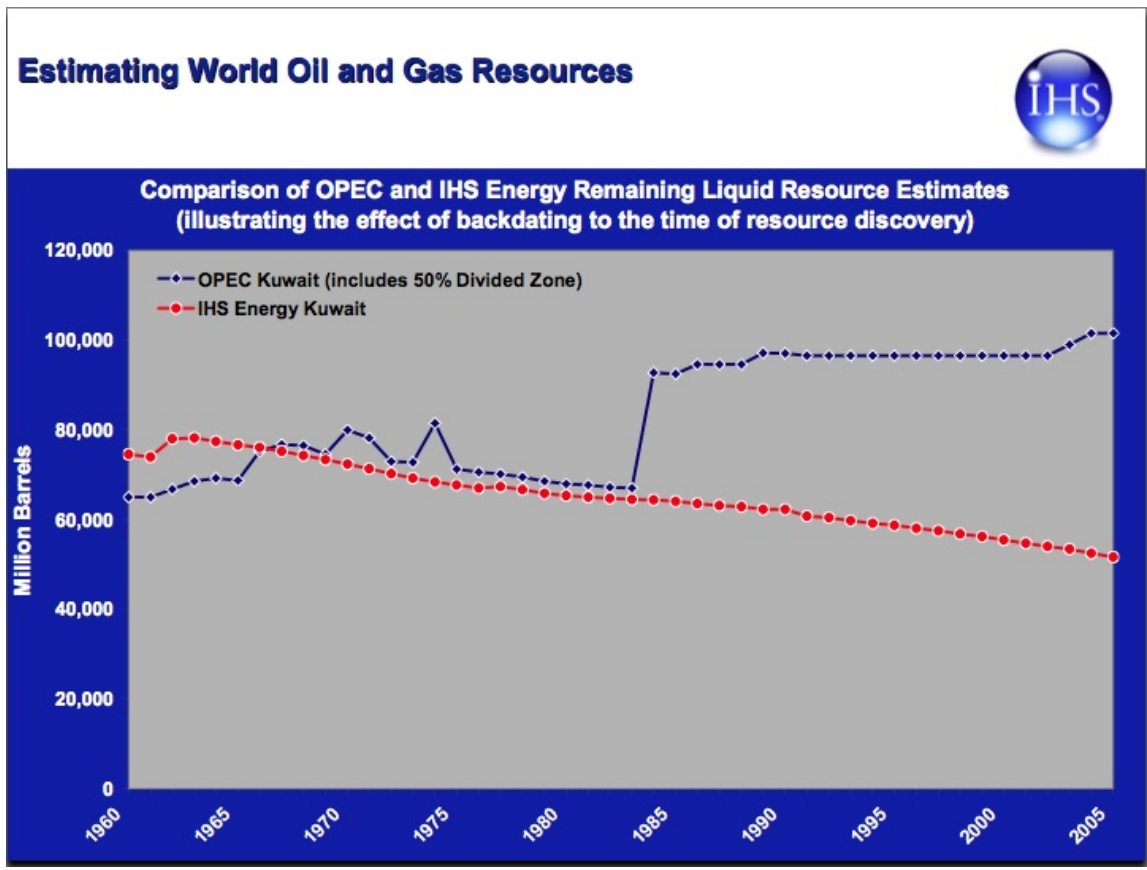


Figure 4. IHS Energy estimate for 2P Kuwaiti reserves.

And speaking to this slide, Ken Chew said:

So this is one of the reasons why it is important to do a field-by-field analysis because it does highlight the politicisation if you like of resource or reserve reporting. A second example shows to me the benefit of back dating in fact because this is what we have for Kuwait. This is the OPEC Kuwait crude reserve estimate, this is the IHS energy remaining resource estimate based on the fields with all the resource back dated to fields date of discovery and then the cumulative production subtracted and you'll see actually that there are periods where the ?? are almost parallel and if we separate the divided zone from Kuwait it would just push to about here. There would be a complete coincidence between what we think is the situation in Kuwait and what Kuwait would support up until this point in time, from which point onwards we have a huge divergence

and this again follows the point at which more or less all of the major OPEC producers suddenly boosted their **alleged** reserves. So that's the second benefit of using backdating.

The official Kuwaiti data are only proven reserves (1P) and Ken Chew made clear that his estimate was for 2P reserves. The rule of thumb for converting $1P = 2P * 0.75$, however, this was added in a later email (10 November 2006):

That one-third on top for "probable" is a ball park figure that I find to be a useful rule of thumb for western companies in their reserves reporting. I have no idea if it will apply in the specific case of Kuwait or Saudi Arabia but I believe that it could be a useful guide for the Middle East as a whole.

On this basis, Ken Chew was reluctant to concede that Kuwaiti 1P reserves would be around 75% of the 2P reserves indicated on the chart.

Looking at the chart for Kuwaiti reserves and considering what was said, one might expect to see a dramatic difference between the IHS data ME OPEC / global reserves figures, and the likes of the bp statistical review, who still accept "inflated" ME OPEC reserves figures without question.

In fact, Ken Chew went to some length to illustrate the weaknesses of The Oil and Gas Journal data. It was alleged this data was not up-dated every year. For example, he claimed that 39 estimates (40%) in the Oil and Gas Journal had not changed for the last five years.

And so given the fact that inflation of Kuwaiti reserves ("political") has been recognised and weaknesses in the Oil and Gas Journal data have been highlighted you might expect to see a dramatic difference between the IHS data estimates and the rest of the pack. Unfortunately the picture is not that simple. The comparison between IHS data, BP, O&G Journal and World Oil is shown below.

Estimating World Oil Resources

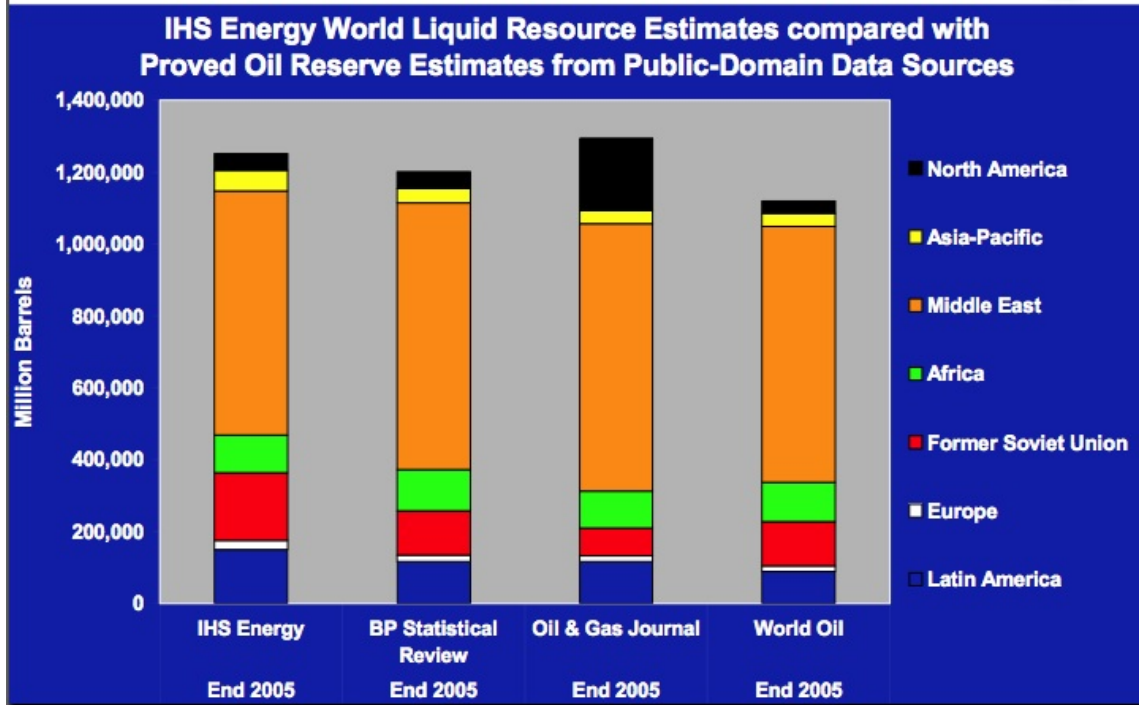


Figure 5. Comparison of IHS Energy data with other sources, and this is where care is required. The BP, Oil and Gas Journal and World OIL estimates are all proved reserves (1P). IHS Energy data is proved + probable (2P) except for North America which is 1P

At first glance it seems that nothing much has changed. But then you have to realise that IHS are quoting proved and probable (2P), except for N America where they show 1P, whilst the other sources are proved only (1P). Personally I find this presentation a bit confusing and I have therefore reproduced the gross figures shown in Figure 5, rebased as 1P in Figure 6.

Indicative comparison of "Proved Global Oil Reserves" end 2005

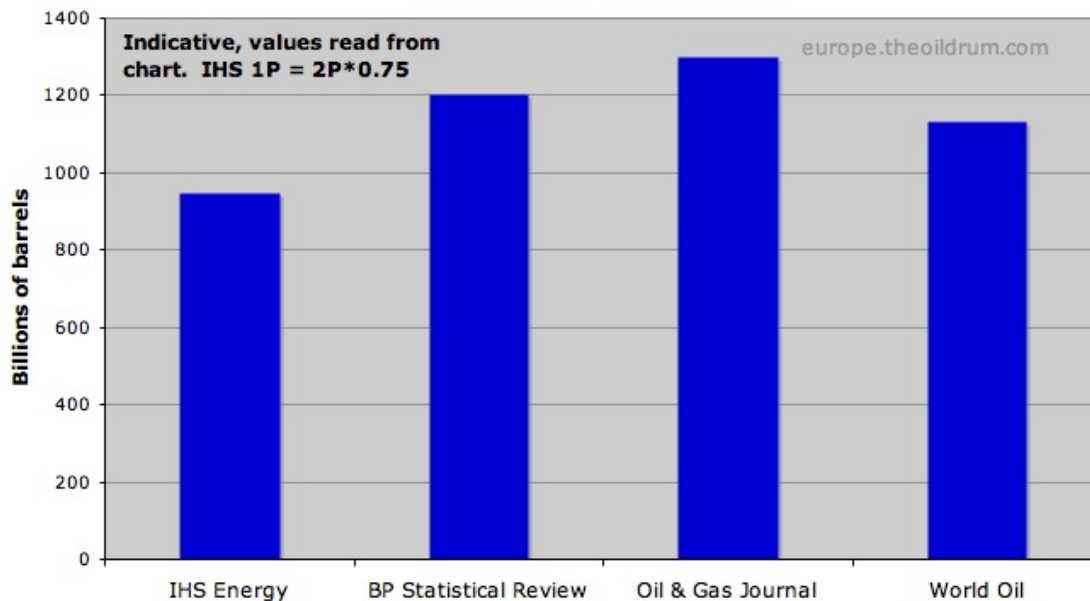


Figure 6. The data shown in Figure 5 rebased as proved reserves using $1P = 2P * 0.75$

Clarification of IHS 1P and 2P

ME OPEC countries are reported to view their oil and gas reserves figures as State secrets and so I was wondering how IHS Energy manage to acquire the geological and engineering data to distinguish between 1P from 2P and this was Ken Chew's response (dated 10 th November 2006):

I indicated in the presentation, we construct our estimates by summing individual fields. So our Middle East number is the composite of 1,156 different fields that contain a liquids estimate of some sort and for each of which we report the best available information. Sometimes that means reporting Ministry or NOC data if nothing more authoritative is available.

In subsequent correspondence it was also indicated that the IHS data base is used widely on a commercial basis by companies, who in the absence of any other data, appreciate getting ball park numbers that are fit for purpose in their decision making process. It is therefore important to recognise that the exercise of using this data to construct a view of Global oil resources is somewhat an academic exercise. Data that is fit for one purpose may not necessarily be fit for another - but it is an interesting academic exercise none the less.

The 1P versus 2P definition applied to IHS data in the case of ME OPEC reserves is not comparable to the 1P versus 2P definitions as it may be applied or understood in the OECD.

A cautionary note comparing 1P reserves with URR

Many readers of The Oil Drum are familiar with the Hubbert Linearisation (HL) technique which, based on historic production figures, provides a "top down" estimate of ultimate recoverable reserves (URR). Proven oil reserves (1P) are a much more conservative estimate and should be significantly lower than URR.

This recent HL for World all liquids from Jean Laherrere shows that recent production increases have led to a possible extension of URR. My own view here, this in part reflects un-used capacity in the ME getting switched on in 2002. These were existing reserves "not seen" by production to that date. My guess is reality will likely lie somewhere between the 2250 and 3000 billion barrel intercepts.

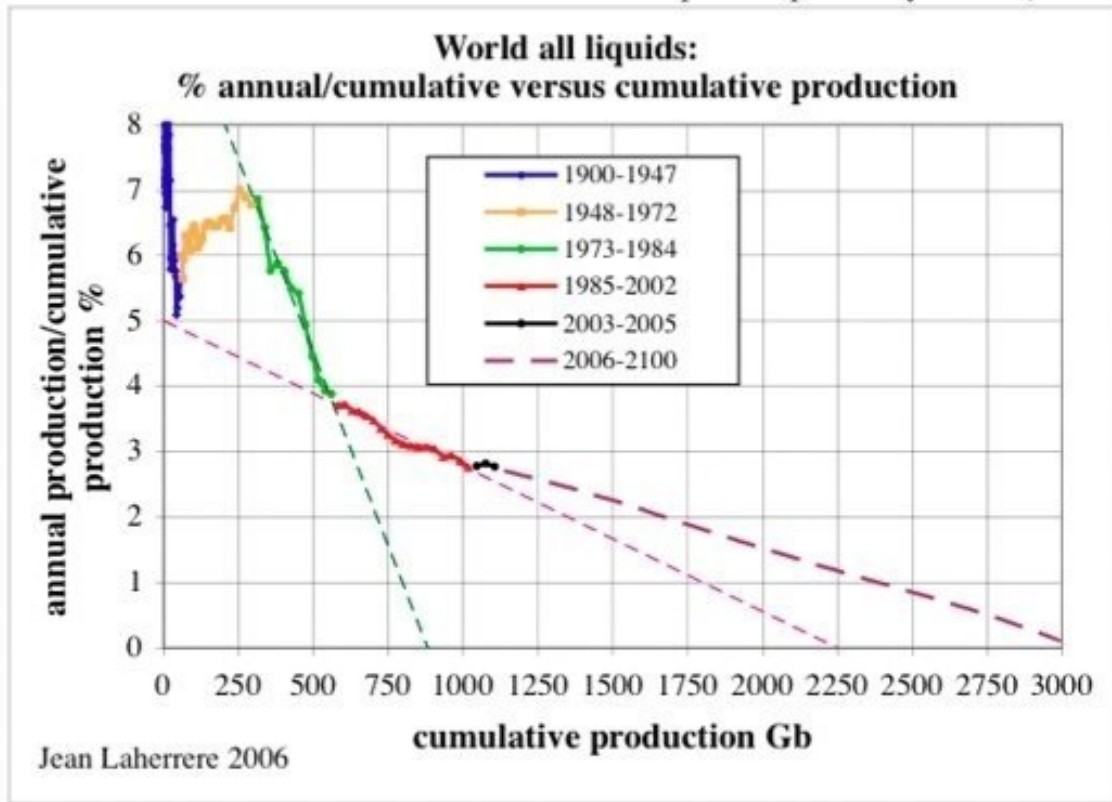


Figure 7. A recent Hubbert Linearisation for World all Liquids from John Laherrere.

The IHS data 1P + production to date gives 2062 billion barrels

The IHS data 2P + production to date gives 2328 billion barrels

The IHS data high end is 3,390 billion barrels

I find it interesting to note that Ken Chew's estimates of 1P and 2P made from the IHS data fall right in the range of the HL - accepting that 1P is over conservative.

Summary

IHS Energy data indicate proved plus probable Kuwaiti reserves to be around 52 billion barrels (read from chart). The proved only reserves figure will be significantly lower.

IHS Energy data suggest proved global oil reserves of the order 950 billion barrels and this is significantly lower than estimates quoted by BP, The Oil & Gas Journal and World Oil.

Euan Mearns BSc PhD
TOD Contributor
fka Cry Wolf

Contributors note: Ken Chew has gone out of his way to be helpful in the compilation of this report. He has also indicated that he finds some comments published on the Internet to be somewhat defamatory. So I would respectfully ask all posters to try and stick to objective facts, observations and argument and to refrain altogether from expressing personalised points of view.

One final comment, Ken Chew has asked me to point out that the opinions presented in his talk and in email correspondence are his own interpretations of IHS Energy data and do not necessarily reflect the views of IHS Energy.



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