



Depletion estimates and the CGES

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Topic: [Supply/Production](#)

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Courtesy of Dave and Matt Simmons I learned that the Center for Global Energy Studies (CGES) has just released a report on [Oil's Depletion Rate](#) (pdf file). Since this is the basic concern that underlies a considerable portion of the current debate about Peak Oil, and figures being quoted for depletion vary from 2% to 14%, depending on which field, and which period one is discussing, I looked for some enlightenment in their conclusions.

I learned, to begin with that

Although it seems straightforward, depletion as a concept is not easy to pin down. The very use of the word "depletion" in this context - synonymous as it is with exhaustion - implies that oil resources are being run down and that one day they will dwindle into insignificance. Oil resources may well become insignificant in the years to come, but it is not certain whether this will be due to their physical exhaustion or to the world moving away from oil and towards another source of energy.

Unfortunately, this suggests, as does the tone of much of the article that follows, that being concerned about oil supplies, largely from the point of the reserve available, is a pointless worry. I say unfortunately because this cornucopian view of the world of oil glosses over the changing situation in the world and conceals some of the assumptions that it makes, by hiding them within the overbounding simplification of its argument.

Let me explain a little what I mean by that, and to help I am going to use some of the numbers and arguments that [Jean Laherrere](#) presented at the Lisbon Peak Oil meeting, where he discussed the relationships between discoveries and production. To begin with the article looks at the issue from a global point of view, rather than on the basis of individual fields. And so let me begin by accepting, for the sake of making this point only, that the world current proven reserve of crude oil (tar sands excluded) at the beginning of last year amounted to 1,109 billion barrels and that the industry extracted 26.38 billion barrels of oil over the course of the year. If no other oil was ever discovered, and that reserve was the total available, then the amount of oil in the ground depleted last year by $26.38/1109 = 2.38\%$. And if the oil could continue to be produced at the current rate, then the world would run out of oil in 42 years.

However each year drilling crews go out and find new oil fields, from which, in time, megaprojects and smaller projects develop. Because the development of those projects takes time, and the world is small enough now that we hear of the developments soon after they start, so folk such as the Oil and Gas Journal, Chris Skrebowski and CERA can all look at those numbers and project production over the next decade or so. In terms of those additions to the world inventory there has been a general concern, in recent years, that new field discoveries have not kept up with the

However reserve growth does not just come from finding new fields, it also comes from a reappraisal of how much oil is in a given field. When I wrote about [Abqaiq](#) the other day, I opened by saying that as the field developed, so the size grew. That is not uncommon. Particularly with older fields the initial discoveries did not fully realize the size of the field, and as wells were drilled out from the initial discovery so the size of the field could be more accurately defined, and in those days that usually meant that it got bigger.

However today's sophisticated equipment allows a much better judgment of the potential size of the field before much drilling has occurred. Those initial estimates are often made before drilling has fully outlined the field, but can lead to overly optimistic predictions. These subsequently meet the reality of borehole data, and the initial well touted estimates have then, often less publicly, to be reduced. And unfortunately, we saw this recently with the announcement of the [Mexican new discovery](#) political frenzy can obscure subsequent fact and the original field size estimate of 10 billion barrels was subsequently [significantly reduced](#) without nearly as much public attention.

A significant amount of information on oil reserves comes from the prognostications of the company [IHS](#) about whom Jean Laherrere wrote

In the past there was only one worldwide source of field reserves, being Petroconsultants funded by a geologist (bought by IHS in 1999). Now IHS, who bought recently CERA, has lost its geological background and uses more and more political data. A new competitor Wood Mackenzie (WM), which uses more economical and technical data than IHS, is completing its country database and can be compared. The difference is very large, higher worldwide than the undiscovered estimate.

and then, writing about UK reserves he notes

It is however surprising to obtain divergent data from the two scout sources IHS and WM when reserves data are provided by DTI, because past annual field production allows estimating directly the field reserve. WM, which reports technical values, is in line with DTI when IHS reports every discovery even if completely uneconomical.

Why is there a discrepancy, and what does this portend in relation to the amount of oil we get from the ground.

Well unfortunately, as the Mexican example shows, just finding some oil in the ground does not mean either that the oil extends completely and consistently through the rock formation that seismic surveying indicated was there, but equally critically, even if the oil is there the question as to how much of it one can get out remains. As I pointed out in my example with Abqaiq, just because there was 31 billion barrels of oil in that oilfield, did not promise that amount could be recovered. If it ends up that about [11.2 billion barrels](#) are produced (going from the Aramco opinion that the field has produced 73% of its oil at the start of 2004) then the recovery factor for the field will be about 36% of the original oil in place. But this is where the rub comes.

Suppose I state that the recovery factor won't be 36%, but rather 60%. Then the amount of oil that started out as the reserve number would be 18.6 billion barrels, and if the field has produced 8.2 billion then there is still a reserve of 10 billion available. Or let me suggest that technology is moving on, we now have horizontal wells (the purported saviors-to-be of Cantarell production),

multiphase pumps, maximum reservoir contact laterals, etc. And so I gaze into my crystal ball and state that Abqaiq recovery factor has now increased to 72%. Well that means we can get 22 billion barrels from the field, and the field - at 8.2 bd produced - is only 37% depleted relative to its ultimate production.

Note that I haven't changed any of the geology, or put any more oil into the ground, but by just changing my numbers (which might have come perhaps from the blonde at the chemin-de-fer table in the Casino Royale at Monte Carlo) I have suddenly created more oil than even Aramco thinks that they can get out of the Abqaiq field, by more than 11 billion barrels.

And this is a significant problem with the CEGS report. By blandly mixing these changing estimates of reserves in with new discoveries one can (without having to explain the tenuousness of the assumptions behind the reserve growth) announce that the world is finding more oil each year than it is producing, and so we don't need to worry.

Unfortunately this is not true. I will confess to one slight manipulation, in fact the IHS numbers for Abqaiq were at 72% in 2004, as the field got closer to exhaustion they have since dropped the RF to 60% in 2005. That, however, was the only field in KSA that they reduced, for the remaining 11 major fields IHS increased their predictions of recovery factor to the following percentages in 2005 (the 2004 estimate is in parentheses):

Ghawar 70%(60%)
Safaniya 69% (54%)
Shaybah 70% (68%)
Manifa 70% (52%)
Zuluf 62% (43%)
Berri 59% (40%)
Khurais 47% (24%)
Marjan 67% (35%)
Qatif 50% (45%)
Abu Sa'fah 52% (52%)
Khursaniyah 55% (55%)

And by that simple change in estimate lo we have increased reserves, in one year, by 80 billion barrels of oil. (Source JL's article cited above). As it happened WM, who had looked at the same fields estimated an increase of 48 billion barrels by a similar shift between 2004 and 2005, but was still some 111 billion barrels less in ultimate recovery estimates for the KSA fields than IHS.

As [Dave](#) said in quoting [Greg Croft](#)

Production and historical production are facts
Reserves are an opinion
Undiscovered resources are a fantasy

He also pointed out that
Only one supergiant (>5 billion barrels recoverable) field has been found since 1980.
That field (Kashagan) is located on a geologic structure that was identified prior to 1980, but was not drilled until 2000 because of sea ice conditions.
The prospects for finding any more are limited, and mostly in the Arctic offshore.

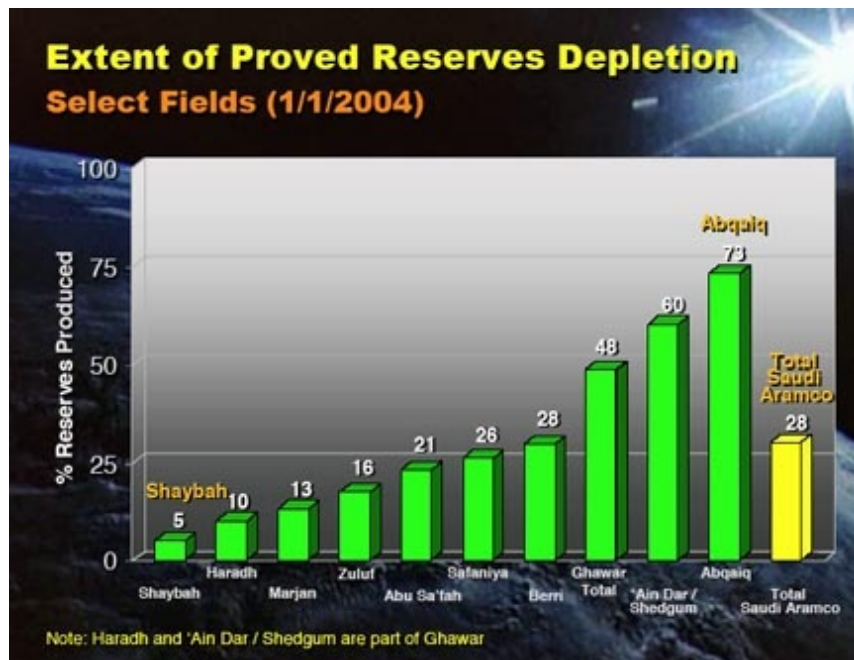
There is still a lot of oil to find, but as fields get smaller, they also produce less individually, so that more must be found, and produced, each year. That is why I am more concerned with production rates than I am with the amount that will ultimately be recovered from a reservoir. After all, if we get that desperate, we can sink a mine and mine the entire deposit - just as they are doing at the surface in Canada today.

(Um, and before you write, no I am not advocating that, but it is an indicator that the use of a Recovery Factor is largely a guess at the moment and does not anticipate how desperate we might get for oil in the future.)

The field by field analysis of what production will look like over the next decade, with some logical explanation as to why the numbers are what they are tells us a considerable amount about what the real situation is going to be within that time frame. However one must also recognize that, as with Abqaiq, as a field gets closer to exhaustion it gets clearer how much can currently be recovered, and, as I noted the other day, in that case the recovery factor was lowered rather than raised.

Making simplistic statements that hide in some pseudo-mathematical approach, unexplained assumptions about critical factors such as RF changes, does no-one any good. And thus one comes away from the CGES report no more enlightened than before. Pity, really.

Oh, and to show where I got the 73% number from for the status of the Abqaiq field (given that we have now had two more years production for a total additional volume removal of around 386,900,000 barrels) the source was the [Aramco presentation at CSIS](#) (pdf file) and the image is



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