

**THE ASSOCIATION FOR THE STUDY OF PEAK
OIL
&
THE OIL DEPLETION ANALYSIS CENTRE
ASPO-ODAC**

NEWSLETTER No 9 – SEPTEMBER 2001

ODAC Contact:

**Dr. R.W. Bentley, Co-ordinator,
Oil Depletion Analysis Centre,
305 Great Portland Street, Suite 12,
London W1N 5DA, UK.
+44 207 436 6544
e-mail : odac@btconnect.com**

Oil and the “Third World War”

On September 11th, the West learnt that it had lost an exclusive prerogative in inflicting *Collateral Damage*, which in plain language means killing innocent people. For the suffering victims, there is little difference between the consequences of the ten-year bombing of Iraq, the missile attacks on Belgrade or the suicidal assaults upon New York and Washington. The perpetrators acted with a comparable sense of mission and belief in the justice of their cause. It is evident that suicide bombers are at least not in it for money.

However, the latest assault was a departure in that it has led to a declaration of War seeking military retribution, although the enemy has yet to be precisely identified. It also came with a deeper meaning as a gesture against the concentration of World power and financial domination at a time of uncertainty and transition. It furthermore differed from other assaults in that it prompted an outpouring of grief and condolence throughout the World, and albeit muted regrets even in countries perceived to be hostile.

It may well be turn out to be one of those catalytic events in history, which change the World.



Figure 1 Archduke Ferdinand and his wife an hour before their assassination in Sarajevo, which led to the First World War

At the root of this transition lies oil, which has driven Western economic prosperity for more than a century, leading in recent years to an extreme concentration of wealth and globalism, as represented by the selected targets.

Approximately half of what is left of this precious commodity lies in just five Middle East countries, which have been forced into a swing role making up the difference between World demand and what the other countries can supply within their natural depletion profiles.

In 1997-8, the production of conventional crude oil reached a peak in the non-swing countries as an inevitable consequence of an earlier peak in discovery. The scene was then set for a gradual increase in oil price, resulting from the decline of spare capacity and the increasing call upon the swing producers. But instead, there was an anomalous fall due to various transitory factors, including an Asian economic recession, which depressed demand, and a devaluation of the rouble, encouraging Russian exports. It was a short-lived collapse before the underlying pressures of depletion and falling capacity re-exerted themselves in a 300% increase in price over 18 months ending in December 2000. This rise in oil price was accompanied by the onset of economic recession caused by the coincidence of the burst of the dot.com bubble and the high oil price itself. As Professor Oswald points out, all previous surges in oil price have triggered recessions

(www.Sunday-times.co.uk/news/pages/sti2001/0902/stibusecm3002)

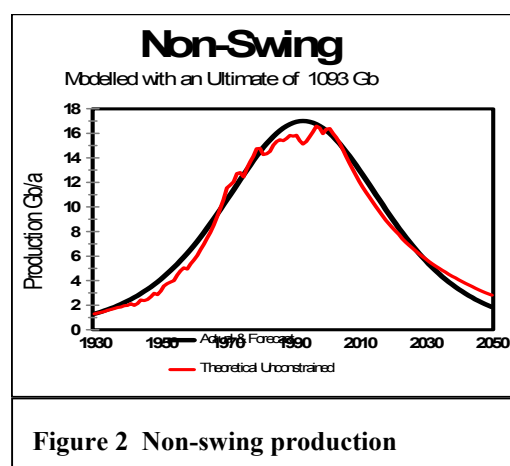


Figure 2 Non-swing production

Recession dampened oil demand, bringing supply into better balance, despite declining spare capacity. That in turn reduced pressure on prices, which have been weak for most of the year, until briefly surging above \$40/b in the wake of the September 11th incident.

If recession continues to deepen, as many commentators now fear, the demand for oil and its corresponding price will likely remain flat or even decline. But if the economy should show signs of improvement, this stability would end, leading to higher oil demand accompanied by soaring prices as the market soon comes again to reach the sloping ceiling of spare capacity. That in turn would likely re-impose recession in a vicious circle.

However, oil demand is not infinitely elastic, as it becomes increasingly difficult to cut essential needs, especially for agriculture, so that recession may not be capable of holding down price for very long. Meanwhile, low oil price will presumably inhibit investments in exploration, non-conventional oil and gas, renewable energy and the all-important priority of energy-saving. In effect, delay will make the eventual crisis even worse.

That scenario sounds bad enough, but it has the edge over an alternative arising from an implementation of the declaration of what may be seen as the '*Third World War*' that calls for military reprisals against not only those responsible for the incident but any countries that may be deemed to be sympathetic to it. It is difficult to avoid the conclusion that Middle East supplies would be interrupted in such circumstances, which, in the absence of adequate spare capacity elsewhere, could not fail but trigger a mammoth surge in oil price with devastating and incalculable consequences for the World's economy and political stability.

As we view these scenarios and their variants, it begins to appear that the World may indeed have experienced a fundamental discontinuity when the economic growth of the past heads into long-term decline, as the principal fuel that made growth possible becomes, first, expensive and, later, in increasingly short supply.

It remains to be seen how myopic governments, who have so-far had the greatest reluctance to focus on the impact of oil depletion, will react to these unfolding events. In any event, they underline the extreme importance of our mission to raise awareness, as we are already beginning to successfully do. The World is not about to run out of oil. At peak, there is as much left as we have used so far, but we do need to use the high supply, while it lasts, to achieve an orderly transition. Energy-saving not only offers a solution but serves to reduce the gross disparities and power politics that led up to the declaration of the '*Third World War*'.

Brasil

There is no standard agreement on the definition of the boundary between so-called *Conventional* and *Non-Conventional* oil. The US Geological Survey, for example, treats all oil as *Conventional* other than that lying in disseminated deposits lacking a clear oil-water contact. For the purposes of determining peak production, however, it is better to identify the different categories so as to determine their respective depletion profiles and calculate their possible contributions to global peak production. We therefore distinguish deep-water and polar oil because they occur in hostile environments, under special geological conditions, and because they are less well known. We use the 500m isobath as the cutoff, which although an arbitrary boundary, does generally serve well to distinguish in geological terms the normal continental shelves from the deepwater domain.

Brasil has long had a desperate need for oil to supply its population of 160 million, and with necessity being the mother of invention, its state company, Petrobras, led the industry into the deepwater domain when its onshore and shallow water territories failed to deliver significant discoveries. In the 1970s, it invited the major companies in to conduct exploration over its extensive shelf under service contracts. Seismic surveys and several unsuccessful boreholes drilled during this campaign provided Petrobras with a knowledge of the basic geology, alerting it to the possibilities of the deepwater Campos Basin. Exploration there began in earnest in the 1980s, leading in short order to the discovery of several giant fields. The oil is sourced in Cretaceous rifts that formed during the initial opening of the South Atlantic, and has migrated upwards to collect in Lower Tertiary sands. They originated as *turbidites*, which may be compared with submarine avalanches, but were locally subjected to re-working by long-shore currents that served to remove the clay components, leaving dune-like deposits with excellent reservoir properties. The discoveries depend on a unique combination of geological circumstances involving generation, migration, entrapment and the critical relative timing thereof.

Four giant fields were found during the 1980s followed by a fifth in 1996, which with other smaller finds have yielded a total of about 10 Gb (billion barrels). Approximately 100 deepwater wildcats have now been drilled.

Operating conditions are however extreme, and small setbacks and accidents can have catastrophic results, as demonstrated by the sinking, with loss of life, of a production platform after an explosion. Furthermore, the oil itself was partly degraded in its tortuous migration; and the reservoirs may be deficient in natural drive. All of these circumstances have combined to hold down production to levels below what might have been expected. Annual plateau production averages about 6% of Ultimate, which is well below that achieved in the North Sea. However, the silver lining of slow depletion is that production will last longer. It is too early to know if other parts of the shelf will be as productive as the Campos Basin, but a prudent estimate would not anticipate more than about 5 Gb from new discovery.

If so, production is likely to peak around 2004 at around 2 Mb/d, before falling sharply.

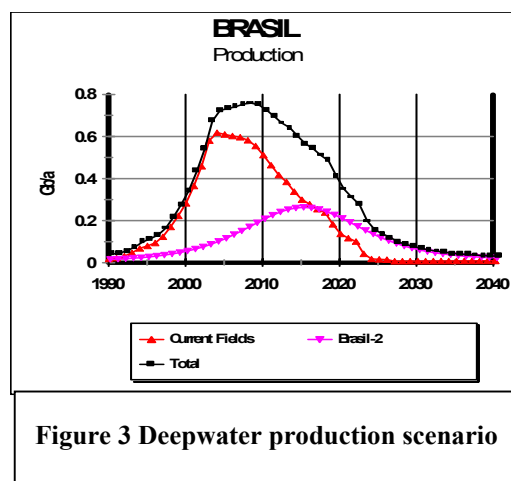


Figure 3 Deepwater production scenario

Looking farther ahead, Brasil faces a devastating energy crisis, even if oil demand can be held steady despite a growing population. As illustrated in Figure 4, non-deepwater production is in long term decline with little hope of reprieve, while the deepwater provides no more than a few years of respite. Imports would have to meet half the country's needs by 2015 and three-quarters by 2020. World prices will by then have soared to high levels under any realistic scenario, meaning that the country will have to severely curtail its use of oil. Although blessed with sunshine, offering scope for solar energy, and an already well-developed hydroelectric capacity, twenty years is not long to effect the transition. In fact, as mentioned in a previous newsletter, its hydroelectric generation failed to meet demand

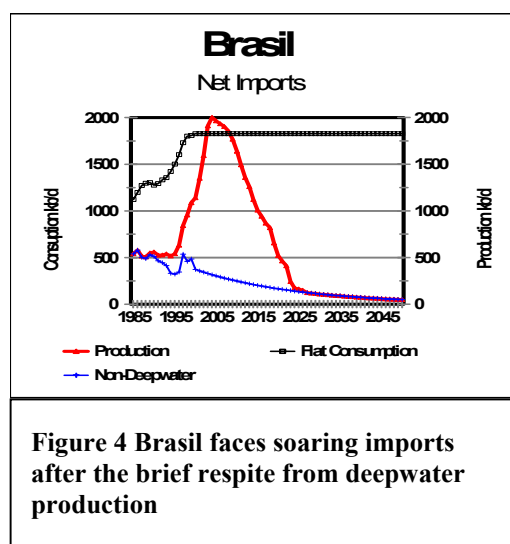


Figure 4 Brasil faces soaring imports after the brief respite from deepwater production

even this year as a result of low rainfall, giving a foretaste of energy rationing.

Report by the US News & Report

This popular US journal with a large circulation carries the following article

A new book argues that the world's oil will soon peter out, but recent numbers are reassuring

BY DAVID LAGESSE

You may have thought you were in the clear when the high gasoline prices of the summer eased in recent weeks. Think again, say a few well-known geologists. They believe the recent energy shortfall may have been a foretaste of a steadily worsening crisis that will set in as world oil production hits a peak this decade, then starts to fall, wreaking economic havoc.

Predictions of a permanent oil crisis are nothing new and are largely dismissed by government, industry, and most academics. But the debate is heating up with the approach of what the pessimists believe is an inexorable deadline, outlined in a book called *Hubbert's Peak -- The Impending World Oil Shortage*, due next month from Princeton Press. At the same time, studies from the U.S. government and others have gotten rosier, saying we'll have plenty of oil for almost four decades -- time to shift to alternative energy sources.

The debate is the legacy of a petroleum geologist named M.King Hubbert, who bucked industry dogma in the 1950s and correctly predicted that U.S. oil production would peak around 1970. Hubbert, who died in 1989, said oil discoveries and oil production follow similar trajectories, hitting a maximum and declining in bell-shaped curves. He noted that U.S. oil discoveries peaked in the 1930s; based on an estimate of total domestic reserves, he predicted that the production peak would follow about 40 years later. Sure enough, domestic oil production topped out in 1970 and has declined ever since, except for a couple of plateaus when prices spiked temporarily. U.S. wells now pump 40 percent less oil than they once did, and the country imports about two thirds of what it consumes.

World discoveries peaked in the 1960s. If world oil follows the same pattern as domestic oil did, production will max out about 2010, and maybe sooner. "The peak of production has to be a mirror image of the peak of discovery," says longtime petroleum geologist Colin Campbell, now living in Ireland, who is outspoken in his warnings. Since production growth barely keeps ahead of demand even today, supplies will quickly run short and prices will soar for everything from gasoline to plastics and synthetic fabrics. Fans concede that Hubbert's math was somewhat suspect, but because he was right about domestic oil, "it's scary to bet against him now," says Kenneth Deffeyes, a Princeton geologist and the author of *Hubbert's Peak*.

Different math is behind the buoyant view of the U.S. Geological Survey, which last year doubled its estimate of the world's remaining oil, to 2.3 trillion barrels. The world is consuming about 28 billion barrels a year, a figure that has grown an average of 2 percent annually over 30 years. But the USGS estimate leaves a comfortable cushion: The U.S. Department of Energy looked at the data and estimated that remaining reserves could meet demand until 2037. And the reserve estimate is conservative, says DOE petroleum analyst John Wood. "There are a lot of things USGS could do to get even higher numbers, but they didn't," he says.

The USGS started with the roughly 900 billion barrels in "proved" reserves. Then it tried to estimate how much oil has yet to be discovered. Committees of geologists laid odds of finding oil in areas now being explored. The longer the odds, the less weight the scientists gave an area in their estimate of total undiscovered reserves: about 700 billion barrels. Much of the new oil would come from the Middle East, already home to most of the world's reserves, and from new prospects off the Atlantic shores of Africa and South America.

Every drop.

The USGS also included, for the first time, a phenomenon called reserve growth, in which industry finds it can pump more oil than expected from a field because of new technology and methods. The USGS looked at the U.S. experience, where technologies such as horizontal drilling and digital seismic imaging retrieve 50 percent or more of a field's oil. In the rest of the world the average is about 30

percent. Exporting U.S. technology and know-how should raise the yields in other countries by about 700 billion barrels, says Thomas Ahlbrandt, the head of the USGS study.

Campbell is skeptical of both these wellsprings of new oil. He criticizes the USGS for including fields with a 1-in-20 chance of producing oil in its estimate of undiscovered reserves, saying those odds are too long to be given any weight. Only about 150 billion barrels remain to be discovered, in his view. He also dismisses reserve growth, saying U.S. laws forced companies here to understate reserves, resulting in what appear to be higher recovery rates than in the rest of the world.

Still, the USGS's upbeat estimate spun around the International Energy Agency, whose members include the major industrialized nations. The Paris-based agency predicted alarmingly in 1998 that oil would peak before 2020 but changed its mind after the USGS report. The U.S. view is also echoed by the IHS Energy Group, an international consulting firm that owns the best database on oil exploration and that once held a more pessimistic view. "Recent data suggests there is plenty of oil out there for the near term," says IHS spokesman Pete Stark.

"Near term" -- that's the consolation of his view. Sure, oil is finite. One day the world will need to shift from oil to other energy sources for transportation and heating, reserving what's left for uses where there is no substitute, such as in some chemical and plastics manufacturing. But four decades would give us a chance to prepare -- providing it doesn't just deepen our petroleum addiction.

The quotation from the US Geological Survey is revealing. It evidently believes that the industry outside the United States is being operated by primitives with limited technology, so that as much as 700 Gb would be added if US "know-how" were brought to bear. It may come as a surprise to the many American oil companies and contractors, who have long been operating throughout the World, to learn that they are using less than cutting-edge methods. On the other hand, no one need dispute the observation of the IHS spokesman that there is "plenty of oil out there for the near term", which is consistent with an early peak and onset of gradual decline, as indicated by his data.

A further insight

Our anonymous contributor provides another insight from his central position in the oil industry, adopting the oil industry's practice of delivering uncomfortable messages in code and camouflage

View from the Future

I recently met a time traveller who told me many things of great value (these things happen). He also showed me a document that I believe to be of great relevance. There is a problem, however, in that the translation of some words is ambiguous, and there is some confusion as to whether parts of the document refer to power in the military sense or the energy sense.

I will summarise the background before I deal with the specific report. It seems that in the world of the 1960s there were large and important private armies and that these in turn levied troops from their colonies. The mightiest armies were found in North America while the main colonial troops were levied in the Middle East. Considerable discontent amongst the colonial troops led to the formation of a radical group – Our People Expect Comforts (O.P.E.C) -- to lobby for better pay and conditions. The generals of the great private armies took no notice of O.P.E.C's demands at all, and, as there was much fighting to do, levied more and more troops from the Middle East and South America. It was around this time that a brilliant but slightly eccentric military strategist and planner called Colonel Hubbert formulated his law. Hubbert's law states that once any fighting unit --army, battalion, regiment etc – has been reduced to half its original compliment it enters into irreversible decline. And further, that the decline can be slowed but never reversed. He even suggested this fate would overtake the great American land armies around 1970. Needless to say, the generals were very angry declaring him to be mad and dangerous, and that such things could never happen to their armies as more troops could always be found. Luckily their attention was distracted by insurrection in the Middle East and the comforting discovery that they could recruit an Alaskan army, otherwise they might have noticed that he was right.

By the early 1970s, insurrection amongst the colonial armies had become so great that they were now effectively run by the local states, many of whom were very supportive of the aspirations of O.P.E.C. In consequence, the private armies had to pay much more for military services but as demand for fighting

remained strong they had to pay while privately determining to minimise their dependence on colonial armies. This plan worked well for 30 years until it became clear that they really had run out of potential non-colonial recruits. They had made strenuous efforts to overcome the problem. First in North America and later elsewhere they recruited increasing numbers of General Auxiliary Services (G.A.S.). These were fairly lightly armed and lacked the punch of the Ordinary Infantry Levies (O.I.L.). Although they became increasingly important their primary weakness was that they could not be used for transportation or logistics. Repeated attempts at retraining and converting them to transportation duties proved expensive and ultimately unsuccessful. Another and rather more successful alternative came from relaxing the weight limit. As a result there were successful moves to raise heavy brigades the most notable of these being the Athabasca and the Orinoco. The generals also gave repeated assurances that they would be able to raise another Alaskan army if only the government would be a little less squeamish about their recruitment techniques. They also indicated that a shakedown of the mountains and parks would also produce more recruits.

As the situation deteriorated and the followers of Hubbert became more assertive in their predictions of problems ahead, the generals came to place more and more emphasis on advisors widely known as PYTIMFs (Place your trust in market forces). PYTIMFs also found great favour amongst governments even though they had no interest in military matters and could never quite explain why price would bring forth infinite recruits without raising the cost. (My informant tells me they fell from favour in 2005 and effectively disappeared, with many denying they had ever said such things)

I am led to believe that the following was a confidential analysis of military strength and prospects at end 2001/early 2002 for the Middle East. The report notes that in 1987 and 1989 the tally of Middle East reservists rose from 400 battalions (bn) to 550 bn and then on to 650 bn without any substantive reason for the changes.

The report specifically notes that while there was a well substantiated tendency for improvements in training and equipment to allow more fighting to be extracted from reservists than might otherwise have been expected, the 1987 and 1989 changes were well outside this range and essentially inexplicable. It also noted that, as reservist numbers were regarded as state secrets, there was a real possibility that the 1987 and 1989 increments were fictional and reflected political pressures amongst the group to be perceived as reservist rich. The report's conclusion was that if the reservist gains were politically motivated correcting them would be essentially impossible as any revised figure would require independent audit which was seen as politically unacceptable.

The report's stated aim was to address the issue of fighting strength without contesting the reservist issue. It aimed to achieve this with an audit of the number of operational units, noting how long ago they were formed and assessing their current fighting status. The report made the assumption that any unit formed more than 30 years earlier i.e. before 1971 was unlikely to offer anything more than static or declining fighting potential.

The key summary table is reproduced below:

Country	Fighting units	Post 1971 units	Potential new units
Abu Dhabi	13	1 Arzanah (disc '73)	None known
Algeria	74	10 (70s), 2 (80s), 2 (90s)	2 or 3
Iran	41	5 (70s), 2(80s)	Several
Iraq	20	5 (70s), 2(80s)	Several, large potential
Kuwait	8	none	limited potential
Libya	76	19 (70s), 3 (80s), 3 (90s)	Some
Neutral Zone	5	none	limited
Nigeria	over 130	30 (70s), 20 (80s), 5 (90s)	potential seatroops
Qatar	8	1 (70s), 2 (90s)	limited
Saudi Arabia	50	3-4 (70s), ? (80s), ? (90s)	unknown
Venezuela	over 200	26 post 1971	mainly heavy
Indonesia	several hundred	very limited	very limited

The report concluded that the expansion potential of the colonial troops was, with the limited exception of Orinoco style heavy brigades, very limited and almost certainly much less than most private army generals had been assuming. It noted that around 70% of the units were formed before 1971 and that most of the subsequent units were very much smaller than the earlier ones. It also drew attention to the fact that in 1974, the group could supply 37 million brigade days (b/d) but that by late 2001/early 2002 its capacity was no more than 32 million b/d. The report's conclusion was that for most of these countries, the chances of maintaining their fighting capability were 'heavily circumscribed' and 'unlikely to be maintained for more than a few years'. It

did however, suggest that there may be significant potential for raising the more lightly armed G.A.S. troops, a source that, so far, had only been lightly exploited in the countries analysed.

Submission to UK Cabinet Office

ODAC's submission to the UK Cabinet Office may be found on the following website. The Cabinet Office is carrying out an Energy Review for the UK government, with a mandate to look at UK energy supplies over the next 50 years. Several oil companies have also made submissions. Reading between the lines, it seems that our anonymous contributor to the last newsletter was entirely correct in saying that the industry understands the situation only too well. They have no particular reason or obligation to discuss it openly.

<http://www.cabinet-office.gov.uk/innovation/2001/energy/submissions/ODAC.pdf>

Compiled by: C.J.Campbell, Staball Hill, Ballydehob, Co Cork, Ireland