

THE ASSOCIATION FOR THE STUDY OF PEAK OIL AND GAS “ASPO”

NEWSLETTER No. 99 – MARCH 2009

ASPO started as a European network of scientists and others, having an interest in determining the date and impact of the peak and decline of the world's production of oil and gas, due to resource constraints. Now, associate organisations are active in Argentina, Australia, Austria, Belgium, Canada, China, Croatia, Denmark, Egypt, Finland, France, Germany, Hong Kong, Ireland, Isle of Man, Israel, Italy, Luxembourg, Japan, Korea, Kuwait, Malaysia, Mexico, Netherlands, New Zealand, Portugal, Russia, Singapore, Slovenia, South Africa, Spain, Sweden, Switzerland, United Kingdom, USA and Venezuela.

(Formally constituted entities are shown in bold face)

Missions:

1. *To evaluate the world's endowment and definition of oil and gas;*
2. *To study depletion, taking due account of economics, demand, technology and politics;*
3. *To raise awareness of the serious consequences of oil and gas decline for Mankind.*

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Spanish: www.crisisenergetica.org

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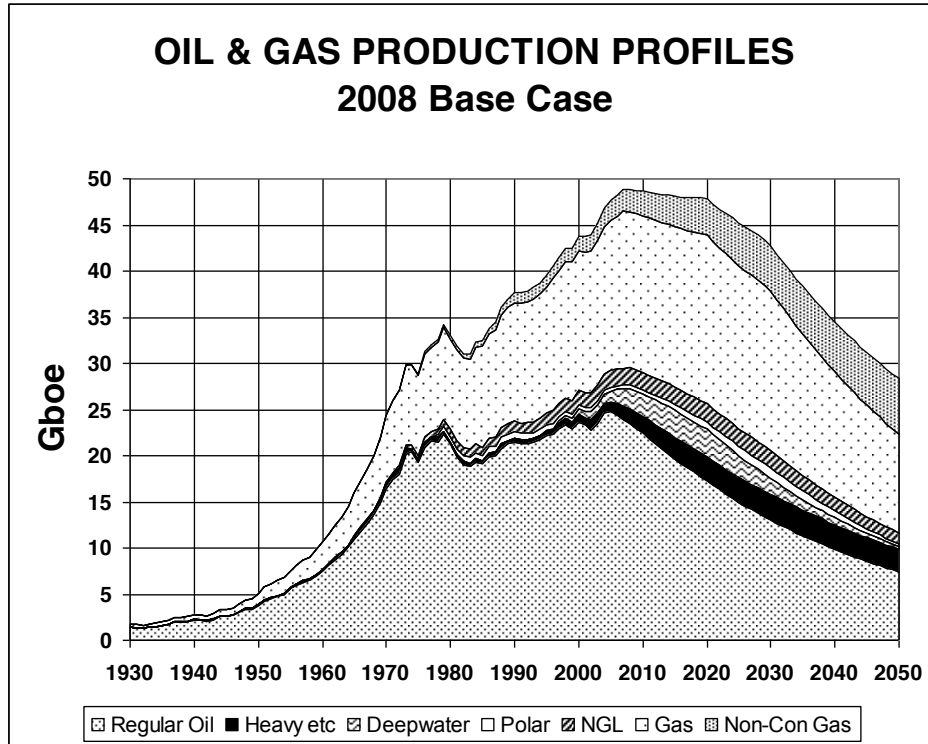
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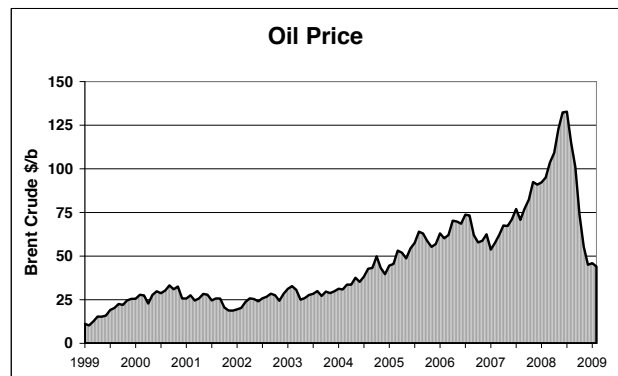
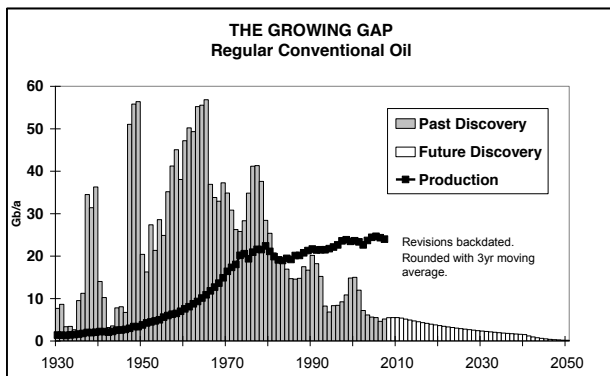
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The General Depletion Picture



ESTIMATED PRODUCTION TO 2100											
Amount			Gb	Annual Production - Regular Oil					Total	Peak	
Regular Oil				Mb/d	2008	2010	2015	2020	2030	Gb	Date
Past	Future	Total		US-48	2.9	2.6	2.1	1.7	1.1	200	1970
Known Fields		New		Europe	4.0	3.5	2.5	1.8	0.9	75	1999
1054	736	110	1900	Russia	8.8	8.2	6.8	5.7	4.0	230	1987
		846		ME Gulf	20	20	20	19	16	673	1974
All Liquids				Other	28	27	23	19	14	722	2005
1156	1269	2425		World	64	61	54	47	36	1900	2005
2008 Base Scenario				Non-Conventional							
Regular Oil excludes Heavy Oils (inc. tarsands, oilshales); Polar & Deepwater Oil; & gasplant NGL Reference date : end 2008				Heavy etc.	4.3	5.0	6.5	7.2	7.7	226	2030
				Deepwater	5.9	6.6	8.1	8.1	4.7	89	2013
				Polar	1.4	1.5	1.7	2.0	2.3	52	2030
				Gas Liquid	5.1	5.5	5.6	5.9	5.6	156	2020
				<i>Rounding</i>					-1		-1
Revised	10/03/2009		ALL	81	80	75	70	55	2425	2008	



1121. A most impressive BBC Programme

On February 20th, BBC-2 broadcast a singularly fine programme produced by Rebecca Hosking and Tim Clark investigating the impact of Peak Oil on agriculture and food supply. It tells the story of Rebecca who was brought up on a small traditional farm in the west of England. Life was hard and she was encouraged to find a new life for herself. She was aware of Nature from her earliest days on the farm and eventually made a career making Nature films.

She recently became aware of Peak Oil and began to see its impact on agriculture, which is so dependent on petroleum for fuel and synthetic nutrients. She also came to realise that modern methods were destroying the soil. An earlier picture of flocks of seagulls following the plough has passed into history as the soil itself becomes barren. At first, it seemed a depressing realisation, but her researches led her to discover new more benign methods of farming. In earlier years, hedges were no more than barriers between fields, but now are found to be capable of supporting diverse crops from the tree tops to the subsoil. Several such experimental holdings were visited offering great promise for a new more sustainable style of agriculture.

Rebecca was herself so impressed by what she learnt that she has resolved to return to her childhood farm to build a new sustainable life. Not only did the film tell a critically important message, but it did so with the most spectacular photography.

Petroleum Man will be virtually extinct by the end of this Century, but the film offers great hope that the survivors can find a new and attractive way of life. No doubt the tensions of the transition will be severe as urban living deteriorates and the world enters the most severe economic depression it has known as is now being increasingly recognised, but the film offers enormous encouragement for those with the vision and dedication to find a new direction.

A remarkable book, entitled *A Short History of Progress* by Ronald Wright (ISBN 10.0.88784.706.4), confirms the assessment explaining how the great civilizations of the past, from the Sumarians of ancient Iraq to the Romans and Mayans, all eventually died out for want of food when the soils on which they depended lost their fertility from excessive agriculture and the destruction of woodlands. Cities developed but became vulnerable as the local food supply dwindled from declining soil fertility. These societies were run by priests and kings, some claiming divine authority. Gold and money became mechanisms for winning power and wealth by an elite who were sometimes benign guardians of the poor, but not always. Apparently, then as now, devaluation and inflation marked peak times, being accompanied by excessive usury. Cicero apparently accused the Roman Emperor, Brutus, of lending money to a starving town in Cyprus at a 48% interest rate. Even the modern banks did not reach that height before they crashed. After the peak of these civilizations came their collapse.

With this background in mind, it is easy to see that the Oil Age fits the general picture, becoming the most extreme example, as oil was much more effective source of energy than the slaves of Antiquity. The peak of this civilisation, if that is the word, was higher but it means that the collapse will be steeper and longer. Already it is admitted that the situation is worse than in the so-called *Great Depression* of the 1930s : it has a good chance of being the greatest ever, being a turning point for Mankind.

1122. An Extension of Resource Nationalism

Under the now largely discredited principles of globalism, the resources of any country were deemed to belong to the highest bidder, and any move by a country to protect its own interest was frowned upon. Even so, there has been a degree of dualism. A few years ago, the United States, a champion of globalism, frustrated for nationalistic reasons a superior bid by China to buy the American oil company, Unocal. Furthermore, the world's financiers, who do tend to have a national base, have basically impoverished the Third World through the mechanism of globalism whereby countries were persuaded to encourage trade such that natural resources, product and the profit from cheap labour were exported, while the country itself became enslaved by dollar debt. Ecuador, for example, found itself having to dedicate its substantial oil revenues in their entirety to service foreign debt, leaving the campesino as badly, if not worse, off than before. Organisations such as the World Bank and IMF played their part. It was globalism in name but had a nationalistic subtext, given the identity of the financiers.

Britain, however, was certainly not guilty of *Resource Nationalism* : during the 1980s and 1990s it depleted its resources at the maximum rate possible, allowing exports, even though it was obvious that such a policy would inevitably lead to subsequent imports as the country's own resources were depleted. In fact, it exported at a time of low oil prices, but now faces rising imports at high prices as world depletion grips. A wiser policy, given that the national interest was a priority, would have been to deplete them slower, so that they lasted longer.

Now, China, which operates a national oil industry, is scouring the world for oil and gas, and its National Energy Administration is considering endowing a fund to do so. It has signed supply deals costing \$42 billion with Russia, Brasil and Venezuela.

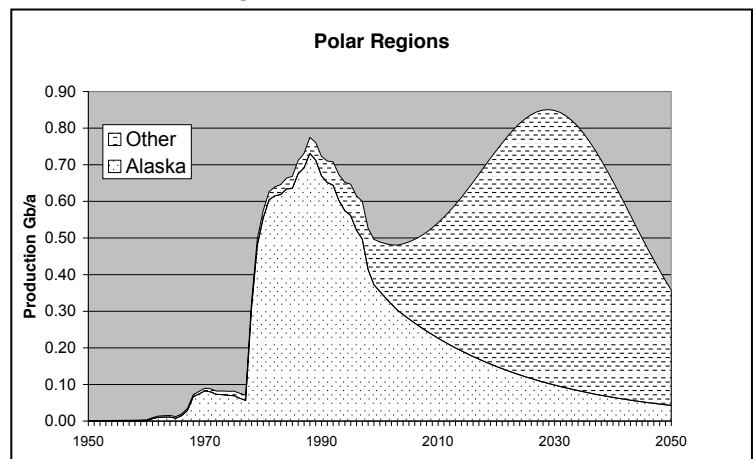
Strategies may again change as the World's Greatest Depression, as it might soon be known, unfolds, putting the last nails into the coffin of globalism. The world financiers have evidently lost their grip, having been consumed by their own greed. Countries and local communities will no doubt again move to protect their interest, preserving their precious resources for their own benefit. Britain in the past welcomed cheap immigrant labour, but now begins to restrict immigration with tighter rules. Before long, we may even see it provide grants to encourage emigration such that the population may fall to a level the island could support. The average age of its farmers is apparently above 60 years. What has all of this to do with Peak Oil? Just about everything is the short answer.

1123. Polar Oil and Gas

Much confusion arises from differing definitions of the boundary between *Conventional* and *Non-conventional* oil and gas. The classification adopted here treats Polar Oil and Gas as *Non-Conventional* for several reasons : first, it is a harsh operating environment which imposes economic and perhaps environmental constraints ; second, it is far removed from tropical areas which were prime source-rock provinces ; third, it has been affected by vertical movements of the crust due to the weight of fluctuating ice caps, having an impact on oil generation and preservation ; and fourth, it is little known. The latter is a particularly important factor, as it is undesirable to allow the uncertainties of its potential to affect the assessment of other regions that are relatively well known. Still another factor is that the Polar Circles are drawn at about 66° on astronomical criteria having no relevance to present or past geological boundaries, so the assessment is partially arbitrary.

The US Geological Survey runs a programme evaluating the undiscovered oil and gas potential of the world and has recently produced a revised assessment of the Arctic (see Fact Sheet 2008-3049). It is particularly useful in defining the various sedimentary basins having potential. It does however use the Probabilistic Method of assessment which deserves some comment. Its primary application in the oil industry has been in modeling reservoir parameters such as thickness, porosity and oil saturation distributions, which lie within a fairly narrow range That seems valid enough, but applying it to the extremely wide range of the assessed undiscovered potential in little known areas such as the Arctic is less sure. Indeed, a classic was contained in the assessment of East Greenland made by the USGS in its earlier report of 2000, when it stated that there was a 95% probability of it containing more than zero, namely at least one barrel, and a 5% probability of more than 112 Gb (billion barrels), delivering a Mean value of 47 Gb – quoted to three decimal places. Obviously, the upside potential of a large almost unknown area is huge, but to take it into account in calculating a Mean value, which is regarded as the *best* estimate, is open to question. There is a certain polarity to *Regular Conventional Oil*, which tends to be there in profitable abundance or not there at all, but in probabilistic terms it is very difficult to assign a zero estimate. It is noteworthy that in the revised 2008 USGS assessment, East Greenland is given a Mean value of no more than 8.9 billion, a radical reduction. Overall, the USGS estimates the potential of the Arctic at 90 Gb of oil and 1700 Tcf of gas, of which about 85% is thought to be offshore. It states that the operational, financial and political constraints, which are clearly considerable, have been ignored.

Obviously, much more exploration would have to be conducted before any realistic estimates could be made, and hopes have to be expressed to justify such investment. But approaching the issue from what might be termed the Peak Oil standpoint, it might be better to take a more sanguine approach, as it is probably unwise to assume that the entry of Polar oil and gas will materially affect the world production decline during the Second Half of the Oil Age, which is now dawning. There are political overtones too because countries are already staking claims : the Russians having planted a flag on the seabed beneath the North Pole.



Certainly, some important discoveries have been made in the Arctic regions of Alaska, Russia, and to a lesser extent Canada and Norway. The Prudhoe Bay Field in Alaska, which holds about 12.5 Gb, is the flagship for oil, with other areas being predominantly gas prone. It is noteworthy that the critical source-rock for Prudhoe Bay is Triassic in age (laid down about 210 million years ago) whereas the Russian finds, amounting to about 260 Gb of oil and 600 Tcf of gas, rely largely on even older Devonian-Silurian sources of double that age. This may be significant as such oil as was formed was subject to dissipation over time, being also depressed into the gas generating window on deep burial. The impression is that it is the sort of province that gives hints of encouragements that fail to materialize save in a few freak occurrences. Even greater uncertainties apply to Antarctica. It is closed to exploration by agreement, but the geological indications are less than promising.

The above figure illustrates our current assessment of Polar oil production for the World. It supposes that the total amount of oil produced in Polar Regions by the end of the Century will amount to 22 Gb in Alaska and 30 Gb elsewhere, giving a total of 52 Gb. It is very difficult to evaluate the gas and gas liquid situation, when so much depends on the construction of pipelines and political factors. Alaska's production has been roughly flat since 1990 in the 400-500 bcf/a range, presumably set by the pipeline capacity, with known reserves standing at about 12 Tcf, implying that about 25 Tcf have been found at least in producing fields. It might be reasonable to expect, say, four times this amount to come in from new fields and pipelines, suggesting that the USGS estimate of 221 Tcf might err on the side of optimism. But it is too soon to be sure.

1124. Flat-Earth Cheers

The oil depletion analysis used here is built on the following elements, evaluated by country, such being summed to give regional and world totals. (See *Atlas of Oil & Gas Depletion* by Campbell & Heapes).

1. Clear definition of what to measure, recognizing that some categories of oil are cheap, easy and, above all, fast to produce (termed *Regular Conventional*), whereas others are the precise opposite.

2. Extrapolation of discovery trends and field-size distributions to indicate the *Total* likely to be discovered through the remainder of the Century. This cut-off avoids the difficulty of speaking of an *Ultimate Recovery*, given that the last barrel on Earth may never be found or produced for all sorts of reasons. Tail-end production in the next Century is unlikely to have any material impact on the overall depletion profile.

3. Subtraction of *Past Production* from the *Total* to indicate *Future Production*.

4. Assessment of the *Percentage of Future Production in Known Fields*, based on the wide range of *Reported Reserves*. They have a wide range of meanings. Some are sound technical estimates; some subject to varying degrees of subjective probability; some are reported for financial purposes under Stock Market rules; and some are politically inspired, such as for example setting OPEC quota, or meeting *Five-Year Plans* under the Soviet system.

5. Calculation of the *Yet-to-Find* by subtracting the indicated amount attributed to known fields from the total *Future Production*.

6. Calculation of annual *Depletion Rate (Annual Production as a percent of estimated Future Production)*.

7. Estimation of future annual production on the assumption that countries that have produced more than half their assessed *Total (Midpoint)* will decline at their current *Depletion Rate*, and that production in countries not yet at midpoint may rise or remain constant as local circumstances dictate, such assumptions not being critical to the overall assessment, as most such countries are now close to midpoint, when the normal decline at the then *Depletion Rate* is assumed to set in.

8. Determination of the dates of peak exploration (based in the annual number of exploration boreholes), discovery and production.

9. Recording areas, populations and consumption.

It is far from an exact science, especially due to inaccurate and inconsistent reporting practices, but certain patterns and relationships emerge delivering a degree of confidence as to the resulting general conclusions. Assessing gas follows a similar procedure, although it is assumed that the depletion profile delivers more of a plateau than a peak.

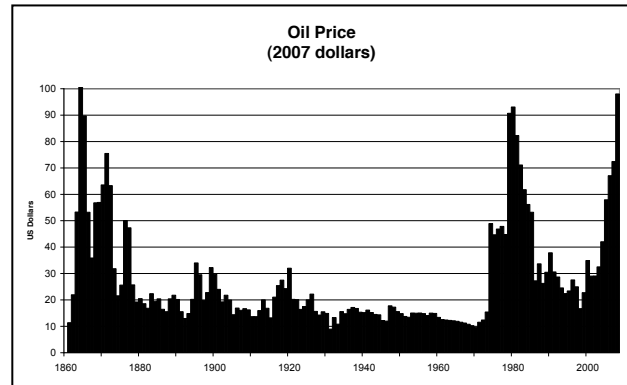
In short, the current assessment concludes that the production of *Regular Conventional Oil* passed its peak in 2005 at 67.8 Mb/d and that all categories did so in 2008 at 81 Mb/d. Note that *Refinery Gains* mean that supply to the market was 2-3% higher.

The above assessment may help explain the current financial and economic collapse, which is increasingly being seen as the worst ever experienced. Oil production, which commenced on a commercial

scale in the mid-19th Century, delivered an increasing supply of cheap and easy energy that stimulated the growth of industry, transport, trade and agriculture, allowing the world population to expand six-fold in parallel. Economic growth was facilitated by the creation of financial capital, with banks lending more than they had on deposit, confident that *Tomorrow's Economic Expansion* was collateral for *To-day's Debt*.

This chapter of history also saw the adoption of classical *Flat-Earth Economics*, perceiving a Planet of infinite resources to be captured by human ingenuity and market forces, with its choir chanting that *The Stone Age did not End for want of Stones*. Prices over most of the period were relatively stable, being partly controlled by the international oil companies or government agencies, such as the Texas Railroad Commission or OPEC which curtailed production to support price. Even so, there were periodic surges, especially in the early 1980s, reflecting political events.

It is evident that prices have been firming since the turn of the Century, as the indicated peaks of production were approached. The main surge however followed the peak of *Regular Conventional* in 2005, being partly driven by speculation on a rising market. The higher prices gave rise to a massive transfer of petrodollars to the governments and royal families of the Middle East, where production costs for much of their oil probably lie in the range of no more than \$10-\$15 a barrel. The resulting surplus may have been recycled to overseas banks with the effect of devaluing currency and destabilizing the global financial structure.



The high prices also began to adversely affect the economy, which in turn undermined the assumption of eternal growth reducing thereby the collateral for current debt. Prices reached a peak of almost \$150 a barrel in mid-2008, but then fell back to 2005 levels as the market sold short on the futures market, the industry reduced its holdings in storage, and demand fell in a crumbling economy.

As usual, different databases show widely different production numbers, but the EIA (an arm of the US Government) reports a peak of 86.8 Mb/d in July 2008 for all categories of oil liquids, including refinery gains, falling to 84.3 Mb/d by the end of the year.

It seems likely that this year will see a further marked decline in production. The flat-earth economists may cheer, being able to attribute it to falling demand from a collapsing world economy, as well as investment constraints. These factors, which are indeed contributory factors, will allow them to persist in denial of physical limits as imposed by Nature, which are anathema to their calling. They can cheer even louder in recognition that their principle of discounted cash flow, whereby the future is deemed in financial terms to be worth less the present, has been more than vindicated.

But whatever other short term factors are involved, the peak ultimately reflects the underlying physical limits imposed by the immutable physics of the reservoirs and the falling discovery trend of the past forty years. Accordingly, even if there are brief economic recoveries, raising production in the years ahead will be progressively more difficult. It is well to remember that for every gallon used, one less remains, which is the underlying driver whatever the short term economic or political factors cause departures from the underlying trend.

The implications are colossal posing the difficult question of how many people the Planet can support in the next Century without the help of cheap and easy oil-based energy, which to-day is equivalent in energy terms to some 22 billion slaves working around the clock. It looks indeed as if this is a *Turning Point for Mankind*. Even so, there is much that could be done to ameliorate the consequences and lessen the tensions of the transition, and it is encouraging that the International Energy Agency, the OECD watchdog, is at last able to reveal what it has long known, and urge governments *to leave oil before it leaves us*. This can give national governments an umbrella for new, even draconian, policies, which might otherwise be difficult to adopt. Energy saving by improved efficiency should clearly have priority even if it runs counter to the past economy built on consumeristic waste. The least effective measure might be to fabricate yet more baseless currency as seems to be favoured by governments in their so-called bail-out programmes, which they hope will restore the outdated practices of the past.

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1125. Saudi Concerns

Saudi Arabia's oil minister, Ali Al-Naimi, warns of a "catastrophic" supply crunch in the near future if current oil prices cause a curtailment of investment. He evidently regards the current oil price at just under

\$50 a barrel as far too low, saying that OPEC, led by Saudi Arabia, is dedicated to cutting production to support higher prices, which he seeks to justify on the grounds that it will deliver investments resulting in more supply for the future. He expresses concern that the consuming countries should seek to reduce their imports by turning to alternative energy sources for environmental or other reasons, suggesting that Saudi Arabia can be a reliable source of oil for the foreseeable future.

There is a somewhat misleading tendency to describe current oil prices as *low*. By all means, they now stand at about one third of the brief surge in mid-2008 when they nudged \$150 a barrel, but they do not seem that low with a slightly longer perspective. Probably, the direct production cost of most Middle East oil is still well below \$20 a barrel, and has been flowing from long established wells not requiring any particular new investment. No doubt, further investment in infill drilling and various forms of stimulation is needed to sustain current production but the incremental supply is likely to be insignificant on a long term global scale.

It rather looks as if the price surges reflected the peak of *Regular Conventional Oil* in 2005 and of all categories in 2008, as imposed by the physical limits. Further investment can ameliorate the decline, but the inevitable downward trend has probably now dawned with far-reaching financial and economic consequences. King Abdullah of Saudi Arabia expresses concern for his grandchildren but his Oil Minister is evidently more worried about the immediate future and the plunging decline in his country's excessive income over the past six months. He is not alone in seeing his income fall radically in the new world that opens.

Brent Crude	Price (\$2007)
1999	18
2000	29
2001	25
2002	25
2003	29
2004	38
2005	54
2006	65
2007	72
2008	98
Present	45

NOTES

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PUBLICATIONS

Multi-Science Publishing Co. (Sciencem@hotmail.com) wishes to advise that copies of the book *Oil Crisis* by C.J.Campbell, providing background reading, are still available for purchase.

~
A privately printed booklet entitled *Living through the Energy Crisis* by C.J.Campbell and Graham Strouts is available from www.zone5.org (price €7 plus postage)

An Atlas of Oil and Gas Depletion

By C.J.Campbell and Siobhan Heapes

Provides an evaluation of oil and gas depletion, together with political and historical summaries, for 65 countries, which are summed into regional and world totals. *Non-Conventional oil and gas* are also covered, and a final chapter places the Oil Age in an historical perspective.

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