THE ASSOCIATION FOR THE STUDY OF PEAK OIL AND GAS

"ASPO"

NEWSLETTER No. 76 – APRIL 2007

ASPO started as a 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, independent national associates are in existence or formation in Australia, Austria, Belgium, Canada, China, Denmark, Egypt, Finland, France, Germany, Ireland, Israel, Italy, Luxembourg, Japan, Korea, Mexico, Netherlands, New Zealand, Norway, Portugal, Russia, Singapore, South Africa, Spain, Sweden, Switzerland, United Kingdom and the United States.

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.

Foreign language editions are available as follows:

Spanish: www.crisisenergetica.org

French: www.oleocene.org (press "Newsletter")

www.aspo-global.org/aspo6

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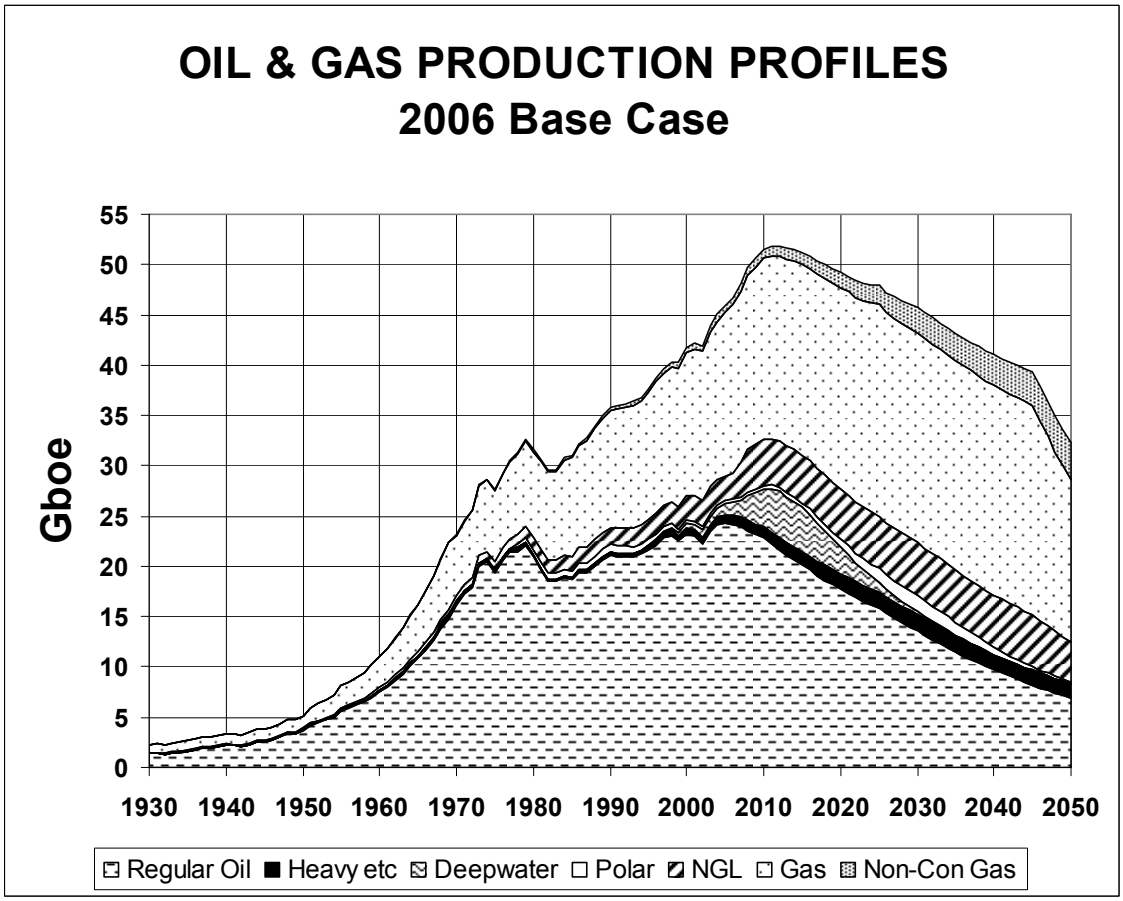
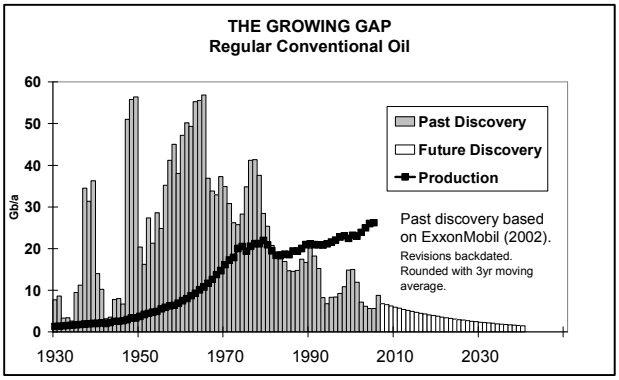
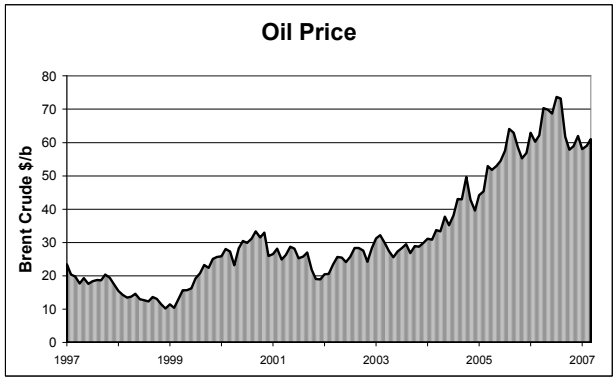
The General Depletion Picture



ESTIMATED PRODUCTION TO 2100										End 2006
Amount			Gb	Annual Rate - Regular Oil						Gb	Peak
Regular Oil				Mb/d	2006	2010	2015	2020	2050	Total	Date
Past	Future		Total	US-48	3.2	2.6	2.1	1.7	0.4	200	1970
Known Fields		New		Europe	4.5	3.6	2.5	1.7	0.2	75	1997
994	775	131	1900	Russia	9.5	9.5	7.7	6.2	1.7	230	1987
	906			ME Gulf	20	20	20	20	11	693	2015
All Liquids				Other	29	27	23	19	6	702	2004
1102	1448		2550	**World**	**66**	**62**	**55**	**49**	**19**	**1900**	2005
2005 Base Scenario				Annual Rate - Other							
M.East producing at capacity				Heavy etc.	2.4	3	4	4	5	152	2030
(anomalous reporting corrected)				Deepwater	2.7	10	12	7	1	69	2012
Regular Oil excludes Heavy Oils				Polar	0.9	1	1	2	4	52	2030
(inc. tarsands, oilshales); Polar &				Gas Liquid	6.9	12	13	14	14	355	2035
Deepwater Oil; & gasplant NGL				Rounding		1	0	-1	-3	23	
Revised 13.2.07				**ALL**	**79**	**90**	**85**	**75**	**40**	**2550**	2011





810. The best lies tell the truth

The New York Times of March 5th carries a fascinating article: its tone is dismissive of Peak Oil and yet it provides compelling evidence for it. It speaks derisively of a small band of retired petroleum geologists while extolling the words of Daniel Yergin, pointing out that he won a Pulitzer Prize - which is a *literary* award.

The article draws attention to a growing interest in steam injection to extract more heavy oil from old fields depicting it as if it were a new technology when it is as old as the hills. No one would dispute that attention will increasingly turn to it after the peak of *Regular Conventional Oil*, although it is costly and delivers a lower net energy yield. Typically patterns of five wells are drilled and steam injected into the peripheral wells to drive the mobilized oil to a central producer, using a lot of energy. Production rates are relatively low.

The article quotes oil company engineers stating that future discovery will be in old fields, which confirms that the stock of prolific new fields is declining, discovery having peaked. It adds that OPEC, which is still able to produce conventional oil, will soon be supplying 50% of the world's needs, implying that the other countries will be in a post-peak decline. It states that *oil companies are returning to old or mature fields because there are few virgin places left to explore*. It goes on to point out that most of past production was easy to find, pump and refine, adding that *as these light sources are depleted, a growing share of the world's oil reserves are made out of heavier oil,* which is only too true.

It seems to confirm precisely what this small band of retired petroleum geologists say: namely that *Regular Conventional* oil is set to decline in the years ahead after peak and that the large remaining amounts of heavy and difficult *Non-conventional* oil will be slow and costly to produce. They give a relatively low net energy yield, being no substitute as such. It is important to distinguish the issue of finally *running out*, which will not happen for many years, if ever, from the issue of *rate* which determines the peak and decline of production.

The New York Times presumably has a motive to distort the news in this way: perhaps that has something to do with the negative impact of soaring oil prices on a delicate Stock Market, but the geriatric geologists would not know anything about that.

Richard Heinberg addresses the same topic, rather more compellingly put:

> **Is Technology the Answer to Peak Oil?**
>
> How does one tell real journalism that's intended to inform the public, from PR-based journalism designed to sell a point of view? Answer: ask typical citizens a simple set of relevant factual questions before and after they read the piece and see if they're better or worse informed by what they've read.
>
> Case in point: the article "Oil Innovations Pump New Life Into Old Wells" by Jad Mouawad (March 5). Mouawad leads with the story of Kern River oilfield near Bakersfield, California--presumably the strongest and most dramatic evidence for his core message. New technology has boosted production there from 10,000 barrels a day in the 1960s to 85,000 barrels a day today. Inference: If the same technology is applied elsewhere, that should dramatically increase available oil. Hence those gloomy geologists who have been warning us about "peak oil" are way off base. Don't worry; go driving!
>
> So here's the first question for the average reader: Is oil production from Kern River increasing or decreasing? Based on the article, any reader would surely say, Increasing, of course! Wrong. Kern River oilfield peaked in 1999, and further technological intervention hasn't helped.
>
> Total U.S. oil production is declining. Ditto Indonesia, U.K., Oman, and over two dozen other nations. The technology touted in the article is widely in use, yet oil production in country after country is peaking and falling, sometimes by 8 percent per year or more. But these simple facts are nowhere mentioned in Mouawad's paean to the wonders of enhanced oil recovery.
>
> Well, so what? What's at stake here? Only the future of industrial society. If the petroleum pessimists are right and world oil production is at or near peak, then we have an enormous problem on our hands. The world's transport systems are 95 percent dependent on oil, and there are no easy substitutes. We will need decades to wean ourselves off the stuff, and if we don't start efforts years before the peak, the result may be economic turmoil such as we have never seen.
>
> Mouawad might have dug a little deeper to find a recent scientific study to test his core assertion--that enhanced oil recovery will result in larger production volumes and substantially delayed production peaks. Such a study exists, published as "Technology and Petroleum Exhaustion: Evidence from Two Mega-Oilfields," by John Gowdy and Roxana Julia of Rensselaer Polytechnic Institute, who conclude that "Patterns of depletion in [the fields studied] suggest that when a resource is finite, technological improvements do increase supply temporarily. But . . . the effect of new technology was to increase the rate of depletion without altering the fields' ultimate recovery."

The article suggests that most experts foresee smooth sailing for world oil supplies. The reality is that few do. The International Energy Agency's Director, Claude Mandil, has said: "On current trends, we are on course for an expensive and dirty energy system that will go from crisis to crisis." Chevron, in recent ads, warns that "the era of easy oil is over." Jeremy Gilbert, former chief petroleum engineer for British Petroleum, believes that a peak in global production is likely within a decade.

Yes, output from a few aging fields has expanded. But it's the bigger picture that matters. California's oil production has declined to levels not seen since 1943, Texas' production has dropped steadily for three decades, and output in Indonesia has fallen by one-third since 1998.

Contrary to Jad Mouawad's cheery picture, the world faces an enormous challenge, and responsible journalists can help by explaining that challenge to the public, rather than lulling readers into dangerous complacency.

811. Cooking Colorado

A very interesting article by Ted Nield in February issue of Geoscientist is entitled *Shale of the Century*. It opens with a description of the shale oil industry of Estonia, which came into existence as long ago as 1838 and still fuels almost all of that country's electricity generation. The so-called *shale* is in fact not shale at all but an immature hydrocarbon source-rock, properly termed *kukersite*. It has to be retorted to between 350 and 650 ^{o}C to deliver its oil and gas, not having been so heated in the Earth. In Estonia, most is simply burned in power stations. The rock, which is richly fossiliferous, is of Ordovician age, laid down some 375 million years ago, surprisingly in the southern hemisphere between latitudes 30-50^{o}. Evidently, plate tectonics over time have moved it to its present location.

The article also describes an amazing project being run by Shell to exploit *kukersite* in Colorado. Electrical heaters are installed in boreholes to heat the stuff to 400^{o}C over a four year period. By then it will have been cooked enough to yield oil which is to be produced from intervening wells. A further string of boreholes is to be drilled around the deposit for the injection of a refrigerant sufficient to make a 10m thick wall of ice, which stops any of the material leaking out to contaminate ground water. It is clearly an energy intensive process, and sceptics might doubt Shell's claim that it has positive yield of 3.5 energy units for every one expended.

As much as anything, the project confirms that easier ordinary oil from conventional wells is heading into decline.

812. Biofuels

Interest is now also moving rapidly towards bio-fuels, with the European Union setting a target that 10% of its transport fuel needs should come from biofuels by 2020. The subject is examined in detail by the Ecologist (March 2007), pointing out that a battle between food and fuel could arise. Apparently, one-sixth of the US maize harvest is now made into bioethanol, yet it supplies only three percent of the country's current consumption of transport fuel. Industrial maize production causes massive soil destruction, requiring large amounts of synthetic nutrients, made from petroleum. Apparently, Borneo has lost more than half of its native forest cover to palm-oil crops, while Brasil decimates the Amazon forests to grow sugar cane for bio-fuel.

A more positive approach appears to be in the development of new plants that convert the mountains of organic waste that modern society produces from its overloaded plates into fuel and compost. Devon in England boasts the first dung-fuelled power station.

813. The Olive Branch of Time

The subject of oil and gas depletion is addressed by at least four different persuasions, each equipped with a different mindset.

- Old fashioned geologists thought in term of measuring and describing rocks, identifying limits;
- Modern explorers think in terms of using their knowledge and skill to propose prospects in ever smaller and more obscure circumstances;
- Engineers think in terms of initial caution and the challenge of extracting ever more oil from known reservoirs;
- Economists think in terms of money, investment and profit, seeing the resource itself as near limitless as summed up by the famous quote from Professor Adelman: *A stream of investment creates additions to proved reserves from a very large in-ground inventory. They are constantly being renewed as they are extracted….*

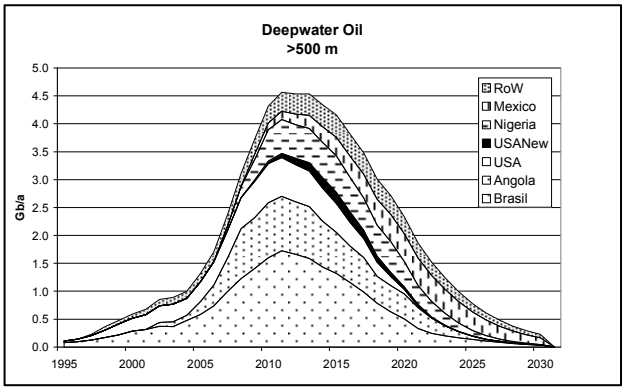
It seems that the notion of *Time* might offer an olive branch by which to bring these factions together. If we abandon the use of the term *Reserves*, and replace it by an estimate of *Future Production* from known

fields to a particular cutoff date, we escape from the notion of a fixed limit, which is so objectionable to some of the persuasions. For example, in the case of Britain it might be possible to win agreement that 31 Gb will have been produced by 2030, of which 26 Gb had been produced by the end of 2006, saying nothing about how much remains after 2030, even if by then production has fallen to a dribble. If that is not possible, it might still be helpful to shift the dispute to the date by which 31 Gb will have been produced, which evades the issue of a limit imposed by Nature. Those with faith in the impact of mammoth investment or miracle technology might propose an earlier date. Others might see merit in reduced extraction rates to preserve more for the future, having the effect of delaying it.

The approach might be useful too to those who do recognise a finite resource limits, because it overcomes the difficult question of modelling tail end production. They might say in the case of Britain that 3.4% of the total amount of *Regular Conventional Oil* ever to be produced remains after 2030, contrasting with Saudi Arabia with 34%, or the world as a whole with 24%.

814. Deepwater Oil

In earlier years, only the shallower parts of the continental shelves could be drilled, but remarkable technological achievements have gradually extended the range, opening what can be described as one of the last two frontiers: the Polar region being the other. The World has of course huge amounts of deep water, leading the ill-informed to foresee near limitless potential, but in reality we are left with the same old geological constraints. The first step before looking into them is to define the deepwater boundary, which is here drawn at the 500 m isobath, which does in many places more or less define the boundary between the *Continental Shelf* and the *Slope*.



There are two deepwater environments to consider depending on whether the area lies in a divergent or convergent plate-tectonic setting.

The most prolific areas are those in divergent settings in the Gulf of Mexico and bordering the South Atlantic. Lakes developed in early Cretaceous times as the continents split apart. Algae proliferated in the warm sunlit waters, with the organic remains falling to be preserved in the stagnant depths. There were later periodic temporary marine incursions as the ocean opened, which led to the deposition of salt by evaporation. It formed an excellent seal for the underlying organic material which was duly converted into oil on being heated with burial. By early Tertiary times, the opening oceans had transported the rifts into deepwater areas at the foot of the Continental Slope. Later, during the Tertiary Period, sand bars at the mouths of rivers occasionally ruptured due to storms or other factors, causing an avalanche-like mass of sand and clay to slide down the slope in what are termed turbidity currents. This material forms a poor oil reservoir with clay choking the pore-space, but local long-shore currents took it back into suspension, winnowing away the fine-grained material to deposit dune-like pods of pure sand, forming excellent reservoirs. Once formed, the deeply buried oil migrated upwards to zones of lesser pressure, and locally found its way into these remarkable sand pods. It is obvious that a remarkable combination of circumstances was necessary.

Convergent plate tectonic situations obtain in other parts of the world, especially in the Eastern Hemisphere. Tertiary deltas have locally spilled into deepwater, but are generally much less prospective because they lack the underling oil-bearing rifts and have to rely on such source-rocks as were deposited in the delta front itself, which are mainly lean and gas-prone.

As always, accurate data on discovery is hard to come by, but the evidence suggests that some 65 Gb of deepwater oil have been discovered. Extrapolating the falling discovery trends suggests that perhaps another 5-15 Gb of generally smaller finds may yet be made, together providing the general profiles indicated in the figure above. The evidence points to a peak of about 12.5 Mb/d by 2011, followed by a fairly steep decline, imposed to some degree by the economic and technological challenges of working in such an extreme environment. It is noteworthy that deepwater oil tends to be rather heavy, which reduces the recovery factor, especially in this harsh operating environment. While there remains scope for surprises in this last frontier, even good ones, it is as well to take this assessment as a reasonable basis for planning until there is reason to revise it.

815. ASPO ITALIA holds its first national Conference

ASPO Italia-1 was held in Firenze on March 10 2007 when members of the Italian section of ASPO (ASPO-Italia) gathered together for their first national conference. It was held in the majestic surroundings of the *Salone de' 500* in Palazzo Vecchio, the most prestigious room of the ancient palace that held the reunions of the *signoria* of old; most kindly made available by the present city government.

There, under Vasari's frescoes, talks were given for a full day to an audience that didn't really reach the 500-mark although not far short of it. The guest of honour of the meeting was Ali Morteza Samsam Bakhtiari, one of the original founders of ASPO international, who came all the way from Iran to give his talk. Bakhtiari spoke in Italian, a language that he said he *had not spoken for 40 years* but which nevertheless he could manage very well. According to him and his "WOCAP" model, peak oil already went by in the summer of 2006; a result that agrees with the calculations of a member of ASPO Italia, Renato Guseo. Bakhtiari cited Dante Alighieri, San Francesco di Assisi, and the eruption of the Vesuvio at the time of the Roman Empire. According to him, it is no more time for models; after the peak we are entering an uncharted territory and we'll have to navigate as well as we can.

After Bakhtiari, talks were given by members of ASPO-Italy on a variety of subjects centered on energy. All the talks were in Italian, so there has been not much resonance outside Italy, but at the national level the conference has received plenty of coverage by the press and TV. A DVD of the talks (alas, in Italian) should be available soon. *(Item furnished by Ugo Bardi)*

816. Declining Oil Revenue

The United Kingdom has just released its national budget, which includes higher taxes on large vehicles, depicted as a gesture towards climate change concerns. But perhaps the more significant item was the fall in oil revenues from £13 billion to £8 billion, with the forecast that that they will collapse further in the future.

Tax distorts most rational behaviour, often being more of a subsidy than a burden. In principle, it is reasonable that people should be asked to contribute a certain proportion of their working week to support national projects and services, including for example even the armed forces used to invade other countries. Workers on offshore rigs drilling in the North Sea would naturally be included. But taxing the oil itself is a little different because it is a finite natural resource: being there for the taking. Not only does it provide the abundant direct energy that people use in preference to their muscle-power, but the tax on it in fact encourages more consumption by lessening the financial burden people would otherwise face on their actual labour. In addition to that, many costs, from the oil executive's high salary to the dry hole, are treated as expenses to be offset against taxable income, representing in effect a form of subsidy. By all means, the executive's salary may in turn stimulate the construction of mansions helping perhaps Polish labourers find a humble living, but at bottom, the money in the first place was virtually created out of thin air.

The creation of money in this way is somewhat similar to the process of banks lending more than they have on deposit, confident that *Tomorrow's Expansion* is collateral for *To-day's Debt* : a confidence that is no longer justified The following quote from the former head of the Bank of England suggests that central banks follow the same dubious short-term practices:

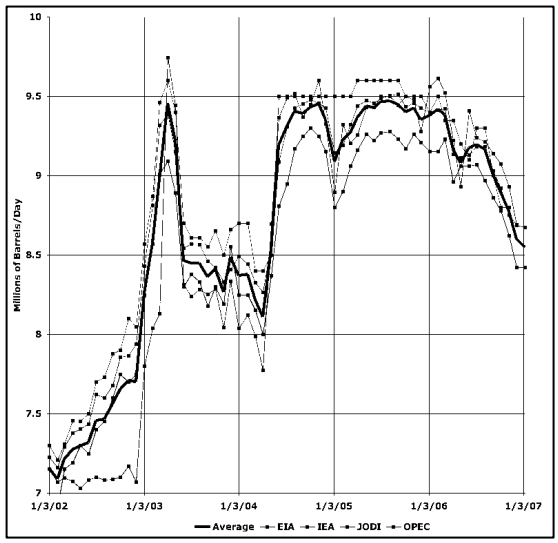
> The Bank of England deliberately stoked the consumer boom that has led to record house prices and personal debt in order to avert a recession, the former Bank Governor Eddie George admitted yesterday.
>
> Lord George said he and his colleagues on the Monetary Policy Committee "did not have much of a choice" as they battled to prevent the UK being dragged into a worldwide economic slump by slashing interest rates. And he said his legacy to the current MPC was to "sort out" the problems he had caused.
>
> Lord George, who headed the Bank for a decade from 1993, revealed to MPs on the Treasury Select Committee that he knew the approach was not sustainable. "In the environment of global economic weakness at the beginning of this decade... external demand was declining and related to that, business investment was declining," he said. "We only had two alternative ways of sustaining demand and keeping the economy moving forward - one was public spending and the other was consumption.
>
> "We knew that we were having to stimulate consumer spending. We knew we had pushed it up to levels which couldn't possibly be sustained into the medium and long term. But for the time being, if we had not done that, the UK economy would have gone into recession just as the United States did.
>
> (*Independent Newspaper*)

The physical decline of oil-based energy supply will likely change all this. With the advantage of hindsight, it might have been better had Britain used its oil inheritance, donated by Nature, more slowly to leave something for future generations, rather that over-stimulate the short term economy not only with direct energy, but huge financial derivatives. It is all a bit odd. (*Reference furnished by Richard Douglas).*

817. Saudi Arabia's Future Production

Hans Jud of Switzerland has made a detailed analysis of Saudi Arabia's production by field, based in part on statements by Saudi officials, which sometimes carry hidden messages. He has modelled individual fields with the derivative logistic method. It converts a bell-curve into a straight line trend that can be readily extrapolated to the total amount recoverable, but may not be entirely valid, given that production in these fields has not followed a bell-curve, partly because they have been artificially constrained in the past for quota reasons. Even so, the general conclusions of the study correctly suggest that future exploration can yield no more than a small fraction of past discovery. It concludes that production can at best be held at approximately current levels to around 2020, declining thereafter to near exhaustion by 2050, at which point a total of 205 Gb would have been produced.

The current assessment preferred here assumes that the reported official reserves are *Original*, not *Remaining*, which, with provision for modest new discovery, gives a total of 280 Gb, of which 107 Gb have been produced already. This model holds production flat to 2025 followed by a terminal decline at 2.9% a year. This is admittedly a relatively low depletion rate, compared for example with 4.5% in the US-48: 6.5% in the UK; 7.2% in Norway or 3.6% in Russia, which could be taken as evidence for reducing the estimate of the Total in the direction of Jud's analysis. Saudi Arabia is now deploying horizontal drilling as it attempts to tap the less productive zones in the Ghawar field, holding almost half the country's total discovery, which tends to support production in the short term, but accelerates depletion, leading to a deferred but steeper decline.



Some analysts wonder if the recent fall in Saudi production heralds the onset of a steep terminal decline, but the resource base suggests that this is unlikely. The wide range of officially reported statistics is noteworthy.

818. US Government Accountability Office

The US Government Accountability Office describes its core values as *accountability, integrity and reliability* in fulfilling its mission of properly advising Congress. It has recently issued a report entitled *Crude Oil : Uncertainty about Future Oil Supply Makes it Important to Develop a Strategy for Addressing a Peak and Decline in Oil Production.*

While the report urges other government agencies to address Peak Oil, it seems to stress the issue of *uncertainty*. Promoting *uncertainty* may well have become a mission for vested interests, explaining why they publish what they do. While no one can claim certainty, the range of plausible oil production forecasts based on physical limits is not a wide one, uncomfortable as that may be.

Calendar - Forthcoming Conferences and Meetings

ASPO members and associates [shown in parenthesis] will be addressing the subject of Peak Oil at the following conferences and meetings. Information for inclusion in future newsletters is welcomed.

2007

April 17	Oil & Gas Summit, **Paris** [Aleklett]
May 28-30	Planning for Oil Depletion ASPO-SOUTH AFRICA Conference **Cape Town** [Ratcliffe]
Sept. 11-12	Geological Society bi-Centennial Conference, **London** [Campbell]
Sept. 17-18	ASPO-6 International Conference, **Cork,** Ireland

2008

ASPO-7 International Conference, Norway

NOTE

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

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