THE ASSOCIATION FOR THE STUDY OF PEAK OIL AND GAS

"ASPO"

NEWSLETTER No. 97 – JANUARY 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, associates 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.

Foreign language editions are available as follows:

Spanish: www.crisisenergetica.org

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

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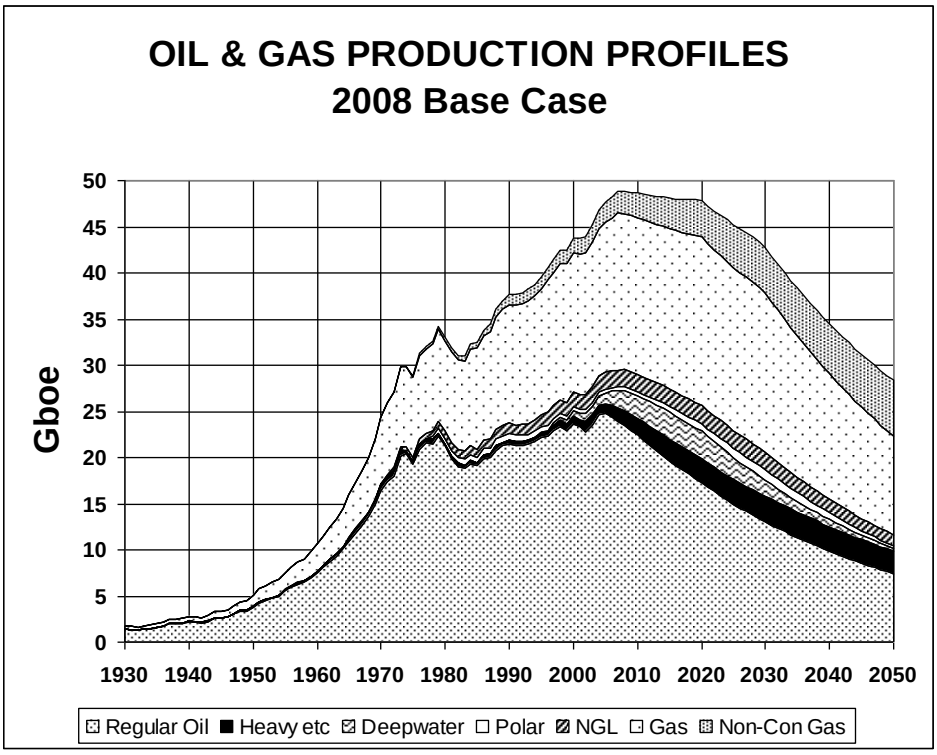
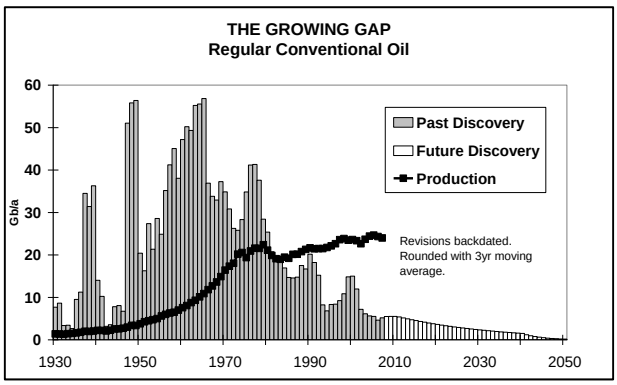
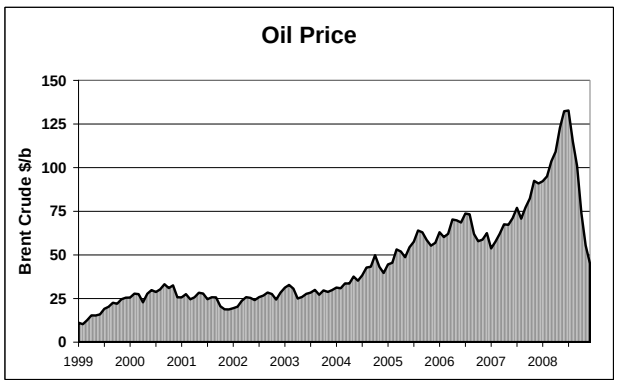
Index of Country & Regional Assessments with Newsletter Reference (*revised)

The General Depletion Picture



ESTIMATED PRODUCTION TO 2100									End 2008
Amount			**Gb**	**Annual Rate - Regular Oil**					**Gb**	**Peak**
Regular Oil				Mb/d	**2007**	**2010**	**2015**	**2020**	**2030**	**Total**	**Date**
Past	**Future**		**Total**	US-48	3.0	2.6	2.1	1.7	1.1	200	1970
Known Fields		New		Europe	4.3	3.5	2.5	1.8	0.9	75	1999
1053	734	114	1900	Russia	8.7	8.2	6.8	5.7	4.0	230	1987
	848			ME Gulf	20	20	20	19	16	673	1974
All Liquids				Other	29	27	23	19	14	722	2005
1154	1246		2400	**World**	**65**	**61**	**54**	**47**	**36**	**1900**	2005
2008 Base Scenario				**Annual Rate - Other**							
M.East producing at capacity				Heavy etc.	4.0	5.0	6.5	7.2	7.7	226	2030
(anomalous reporting corrected)				Deepwater	5.2	6.6	8.1	8.1	4.7	89	2013
Regular Oil excludes Heavy Oils				Polar	1.2	1.3	1.7	2.2	3.0	52	2030
(inc. tarsands, oilshales); Polar &				Gas Liquid	5.1	5.1	5.2	5.4	5.1	147	2020
Deepwater Oil; & gasplant NGL				*Rounding*		1			-1	-14	
Revised 20/12/2008				**ALL**	**81**	**80**	**75**	**70**	**55**	**2400**	2008





1107. IEA Half-Truths

The International Energy Agency, which was established by the OECD to monitor energy supply and demand, has now issued the annual update of its World Energy Outlook. It has not yet been possible to obtain a copy of the report itself, so for the present we can do no more than review comments and excerpts by those who have studied it.

In general, it has to be said that the agency does not inspire confidence, seeming to have been substantially a politically motivated organisation designed to try to protect OECD consumer interests in the face of OPEC's past control of world oil supply. David Strahan has written an excellent review in *The Guardian* of December 3rd, appropriately entitled *Pipe Dreams*. He points out that the organisation is gradually being forced by circumstances to begin to admit to the impact of depletion as imposed by Nature, or risk losing all credibility.

Its 1998 World Energy Outlook, which was partly based on a comprehensive country by country analysis utilizing the industry database on discovery, reserves and production, concluded that demand would outpace supply by 2010, save for the entry of what was termed *Unidentified Unconventional*. That was evidently a coded message for shortage. But, in the next issue, it had second thoughts, or, more likely, was instructed to have them by its OECD masters, and attributed the missing supply to *Conventional Non-OPEC* without comment or explanation.

Now, ten years later, it tacitly has to admit that the missing *Unidentified Unconventional* has not been identified, and speaks of the looming and serious supply shortfall. It evidently cannot yet quite bring itself to accept the resource limits and immutable physics of depletion, suggesting that under-investment, partly driven by the recent fall in oil price, might lead to a crunch by 2015. It also assumes that Iraq will triple its production to 6.4 Mb/d, which might be somewhat optimistic given the difficult political situation. It does nevertheless accept that production in fields past their peak is declining at an average of 6.7% a year.

Its so-called *Reference Scenario* assumes that production will rise to 106 Mb/d by 2030, contrasting with the Depletion Model used herein which has the production of *Regular Conventional* oil and *All Liquids* falling to respectively 36 Mb/d and 56 Mb/d by that date. The IEA expects prices to rise to $120 a barrel, even though high prices lead to economic recession that cuts demand and reduces pressure on price. Given the likelihood of rampant inflation, it is important to stress that prices refer to 2008 dollars.

But perhaps, at the end of its day, the IEA report serves its purpose well enough, for in the real world, politicians may prefer to read between the lines, rather than the situation squarely, as David Strahan perceptively suggests.

We may also note in passing too that the National Intelligence Council of the United States has published a forthright report accepting *Peak Oil*, and virtually admitting that it spells the end of that Empire (see *Global Trends 2025 : A Transformed World*).

1108. Iran Revisited

Last month, we risked trying to evaluate Iraq's production profile, despite the many uncertainties, and this month might as well go for broke with a look at its neighbour, Iran.

IRAN						**MIDDLE EAST**			**2008**	
Production to 2100						**Peak Dates**			**Area** sq.km x 1000	
	Oil	**Gas**	**Rate**	**Oil**	**Gas**		**Oil**	**Gas**		
Amount	Gb	Tcf	Date	Mb/a	Gcf/a	Discovery	1964	1964	Onshore	Offshore
PAST	63	76	2000	1349	2700	Production	1974	2030	1650	15
FUTURE	67	1074	2005	1511	3350	Exploration	1967		**Population**	
Known	57	1020	2010	1430	4276	**Consumption**	Mb/a	Gcf/a	1900	10
Yet-to-Find	10	54	2020	1148	6964	2007	584	3610	2008	72
DISCOVERED	120	1096	2030	922	11344		b/a	Kcf/a	Growth	7
TOTAL	130	1150	**Trade**	+846	+83	Per capita	8.1	51	Density	44

Essential Features

Iran is a mountainous country, covering almost 1.65 million sq. kms, between the Caspian Sea and the Persian Gulf. The deeply eroded Zagros Mountains run parallel with the Persian Gulf, with peaks over 4,000m above sea-level, while the Elburz Mountains form a narrow range in the north rising to over 5,600m. A narrow, fertile and partly forested, belt separates the mountains from the Caspian. To the east, lies an extensive arid plateau, with salt flats, at an altitude of about 900m, which is in turn flanked farther to the east by ranges of hills along the frontier with Afghanistan and Pakistan.

The climate ranges widely from freezing winter conditions with snow falls in the northern mountains to hot summers over most of the country. Much of it is arid, with the highest rainfall being found in the north on the shores of the Caspian and in some of the mountain valleys.

The country supports a population of 72 million, made up of several distinct tribal and religious groups, mainly of Aryan origins. Some 8 million live in Tehran, the capital, located at the northern end of the interior plateau at the foot of the Elburz Mountains.

Geology and Prime Petroleum Systems

The Zagros Mountains mark the collision of the Arabian and Asian tectonic plates. From a petroleum standpoint, interest is concentrated on the foothills and the adjoining waters of the Persian Gulf, where a sequence of mainly Mesozoic and Tertiary sedimentary rocks, as much as 15,000 m thick, has been preserved.

The foothills are characterised by huge anticlinal structures that formed as rock masses slipped off the rising mountains on a glide-plane provided by a layer of Miocene salt. The prime source-rocks are deeply buried Jurassic clays, which in southern Iran have been depressed into the gas-generating window, but there are also leaner, yet still prolific, source-rocks in the overlying Upper Cretaceous and Eocene sequences. The main reservoirs are the fractured limestones of the Miocene, Asmari Formation. Pliocene evaporites give effective seals to the reservoirs, which as a result have exceptionally long oil columns, commonly with substantial gas caps, possibly being partly recharged from depth. They are not easy reservoirs to manage, being prone to high-pressure gas invasion.

The Qatar Arch is an important oblique uplift that cuts across the Persian Gulf, extending from Arabia into Iranian waters. It has brought into range a deeper petroleum system, made up of Silurian source-rocks which have charged the overlying Permian sands with substantial amounts of gas-condensate.

Exploration and Discovery

Exploration commenced in the early years of the last century when the Anglo-Persian Oil Company (now BP) secured exclusive rights to the country. The huge exposed anticlines of the Zagros Mountains provided prospects readily identifiable by the field geologists of the day, whose pioneering work was rewarded when a well at Masjid-e-Sulaiman (the Mosque of Soloman), blew out on May 26th 1908, finding not only a giant oilfield with 1.3 Gb of oil but opening the world's largest oil province.

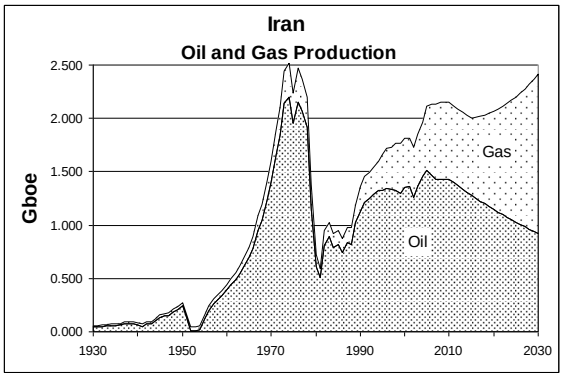
Exploration continued, with important finds in 1928, 1936, 1958, 1964, and 1992, giving an overall peak of discovery in 1964. A total of some 400 exploration boreholes have now been drilled, peaking in 1974, when some 22 were drilled. In fact, this is a relatively modest effort compared with that of other countries, but it is evidently a concentrated habitat in geological terms, with the bulk of its oil lying in comparatively few large structures.

It is very difficult to assess the endowment due to the extremely unreliable nature of the data, but total discovery to-date is here estimated to have been 120 Gb, of which 57 Gb remain, with scope for the addition of an estimated 10 Gb to come from future finds. It will be remembered in connection with this assessment that Iran was reporting reserves of 49 Gb in 1987, consistent with a long prior trend when the country's oil industry was controlled by international companies. It then announced an increase to 93 Gb, closely matching Kuwait's anomalous revision of 92 Gb, in order to protect its OPEC quota. Total production to 1987 amounted to 35 Gb, which suggests that the new estimate represented the total found (49+35=84 Gb) with a slightly higher recovery. Accordingly, the revised number might have referred to *Original*, as opposed to, *Remaining* reserves.

The country also has a substantial gas potential, especially in the southern Persian Gulf. It is claimed that some 1100 Tcf have been discovered, of which comparatively little has been produced, but the data are very unreliable. Despite its own substantial endowment, Iran imports gas from Turkmenistan to supply the capital, Tehran.

Production and Consumption

Oil production commenced in 1913, and grew to an early peak of 6 Mb/d in 1974, before falling to a low of 1.3 Mb/d in 1981 as a result of OPEC quota and other political factors. It has since increased to almost 4 Mb/d. It is difficult to forecast future production, but the estimates adopted here suggest that some 48% of the country's oil has been depleted, which means that there is only a limited theoretical scope for production to increase. On balance, bearing in mind the political situation, it is here assumed that production will commence its terminal decline in 2010 at about 2% a year. If the country should come under military attack, production would no doubt decline steeply, ironically leaving more in the ground for the future.



Gas production has risen to its present level of 3.7 Tcf a year, roughly in parallel with oil, and is expected to rise in the future, both as it becomes possible to draw down the gas caps of existing oilfields towards the end of the lives, and by tapping new deeper sources, especially in the south-eastern Persian Gulf. It will be largely used to meet domestic demand but some may be exported as Gas Liquids, of which current production stands at about 120 kb/d.

The Oil Age in Perspective

When *Homo sapiens* stepped out of Africa, some four million years ago, one of his first stopping places was the Middle East, the site of the biblical Garden of Eden. There is a theory that the Planet was struck by comets 7,000 and 4,000 years ago which gave rise to tidal waves wiping out the inhabitants of the lowlands, as well as depositing salt flats

in America and populating the landlocked Caspian with marine life. If so, the inhabitants of the Zagros Mountains may have been one of the groups to survive: indeed, it has been suggested that their primitive astronomy was sufficient to anticipate the second comet, leading the people to head for the hills with their cattle, which may be the origin of the legend of the Ark.

At all events, Iran (or Persia as it was previously known) is clearly an ancient country with a long and complex history. The first Persian Empire was established in the 5th and 6th Centuries BC by the Medes, from whom the current Kurds are descended. It held dominion over the Middle East, Egypt and parts of Greece, but later fell to Alexander the Great of Greece, followed in turn to the Roman Empire. Its demise allowed a national resurgence under the Sasanid Empire, known for its fire-worship, based on natural gas seepages and burning hydrocarbon source-rocks. That was in turn defeated by the Arabs in 636 AD who brought the Muslim faith to the country.

Then in 1218, a devastating invasion by Mongols, led by Genghis Khan, literally decimated the population by famine and massacre. That was followed by the Safavid Empire, lasting from 1501 to 1920, whose dominion at its prime extended over most of what is now Iraq and eastern Turkey. It was a powerful empire espousing the *Shi'ia* brand of the Muslim faith, but it too eventually gave way to factional disputes. Its end was hastened by serious famines that struck the country in 1870-71, and again in 1917-19, when millions died.

The growth of the oil industry in the late 19th Century prompted various entrepreneurs to turn their eyes towards Iran. They included an Englishman by the name of William Knox D'Arcy, who sent an agent to try to negotiate oil rights in 1901, facing competition from the Russians. This in turn prompted moves by Britain to bring Iran into its sphere of influence and frustrate Russian ambitions, which encouraged various elements within Iran to move towards reform and modernisation. That led to a *coup d'etat*, in which an army officer by the name of Reza Khan (later to be known as the Reza Shah Pahlavi), came to power with new policies, initiating the construction of roads and railways, as well as a national education system. Trying to balance the rival pressures of Britain and Russia in the inter-war years, he welcomed German friendship and influence, but that prompted an invasions by Britain and the Soviet Union during the Second World War, forcing the Shah to abdicate in 1941 in favour of his son, Mohammad Reza Pahlavi.

New pressures followed the war with the emergence of a popular nationalist politician, Mohammed Mossadegh. He was the son of a Bakhtiari finance minister and a princess, and had been educated in Switzerland. He sought to establish democracy in the country and nationalise the long-standing exclusive oil concession with the Anglo-Iranian Oil Company, the predecessor of BP. The Prime Minister, who had opposed the move, was assassinated in March 1951, and, the Iranian Parliament moved a few days later to nationalise the company's rights, appointing Mossadegh as the new Prime Minister.

Although the post-war Socialist government of Britain had nationalised many industries at home, it opposed a comparable move by Iran, withdrawing BP's technical staff and embargoing exports, which had serious adverse economic consequences for the country.

Britain then sought the help of the US Secret Services to depose Mossadegh under the so-called Operation Ajax, and called on the Shah to exercise his prerogative to dismiss the Prime Minister, having fomented various internal disputes. Mossadegh was successfully removed and spent the remainder of his life under house-arrest. His successor, Fazlollah Zahedi, soon came to terms with the foreign interests, forming the so-called Consortium whereby American oil companies, Shell and CFP of France took 60% of what had previously been BP's exclusive position, eventually being persuaded to pay the company compensation for its loss.

The Shah, being fully backed by the US and British Governments, became increasingly autocratic in the ensuing years, suppressing political opposition in his country with the help of a secret police force. He was however denounced by a religious leader, the Ayatollah Khomeini, who was subsequently exiled. It prompted growing popular opposition to the Shah, which erupted in the form of the Iranian Revolution of 1978. Mass popular demonstrations caused him to flee the land in the following year, allowing the Ayatollah to return from exile and declare an Islamic Republic. Relations with the United States deteriorated when a group of students seized the staff of its embassy as hostages, in order to press for the return of the Shah for trial. They were later freed despite an abortive US military mission.

Perceiving the level of US opposition to the Iranian Government, Saddam Hussein, the leader of neighbouring Iraq, saw an opportunity to press earlier territorial claims to give his country a greater access to the Persian Gulf, and decided to launch a military attack in 1982. It evolved into the Iran-Iraq War that lasted six long years, with massive loss of life on both sides. Iraq was actively supported by the United States, Britain and other countries, which furnished military and financial aid.

A new government came to power after the death of Khomeini in 1989. It sought to improve relations with the west, but with little success. In 2003, US and British forces invaded Iraq, and President Bush declared Iran to belong to what he termed an *Axis of Evil*, in part because of its sympathy for the dispossessed Palestinians. Tensions grew in subsequent years with the imposition of further economic sanctions against the country, and the rising threat of direct military intervention. It is said that Iran's nuclear facilities pose a potential threat, but there can be little doubt that its control of the Gulf of Hormuz, through which Middle East oil exports pass, is a prime strategic factor in the dispute. Even a minor naval action by Iran would force up tanker insurance rates to prohibitive levels.

Looking ahead, Iran, which still has substantial oil and gas resources, now supplemented by nuclear power, appears to be relatively well placed to face the Second Half of the Age of Oil, assuming that it is not subject to a US invasion. Such an attack might achieve an initial military success, but would undoubtedly alienate the mass of the people numbering 72 million, who would be difficult to subjugate.

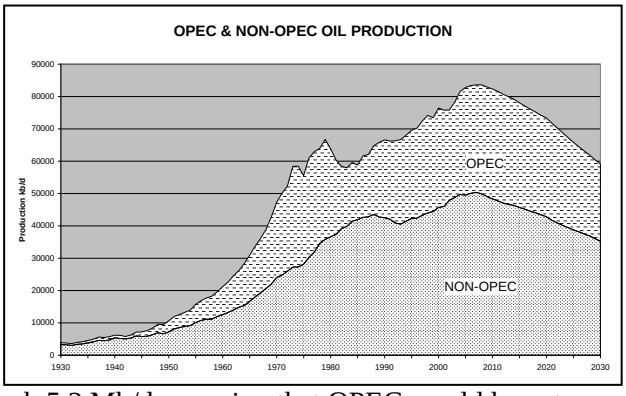
1109. Oil Storage

In normal conditions, oil companies maintain storage in so-called tank farms, adjoining their refineries and terminals, simply to balance the fluctuations of crude supply and the sales of refined product. But in times of anomalous global price fluctuations, storage becomes more of a speculation: filling the tanks when prices are low and emptying them when prices rise anomalously may well contribute to a self-fulfilling mechanism of price fluctuation and profit. These physical actions are complemented by the buying and selling of future contracts on the market. These contracts can themselves be traded, and become divorced from the constraints of actual storage. Borrowing money on the back of these transactions is a further element providing an additional distortion.

Tankers form an additional form of storage that can be chartered and simply anchored somewhere as the price structure evolves, which must in turn be a useful business for tanker-owners. Modern tankers can hold as much as 26 million barrels, which at $50 and $150 a barrel would be worth respectively $1.3 billion and $3.9 billion. It is significant in this connection that Shell has recently chartered a tanker to store oil from the Forties Field in the North Sea at a port in Scotland (according to Bloombergs and shipping agents), and there are reportedly some twenty others in various ports around the world. It suggests that the industry anticipates that prices will rise again in the not too distant future.

It has even been suggested that speculating in oil storage might be a great deal safer that taking a position in the stock market or other financial instruments. Whereas pricing on the stock market bears little relation to the actual underlying value of the assets, oil at least is readily identifiable and essential commodity on which the world will continue to run, even in recession.

1110. The Role of OPEC



With oil prices still languishing, if that is the word, below $50 a barrel, OPEC has decided to cut production as from January 1st by 2.2 Mb/d to support price, and is evidently receiving some support from non-OPEC producers, especially Russia. But so far, this action has had little impact on price.

The IEA expects world consumption to fall by 200,000 b/d by the end of this year, whereas Platt's Oilgram quotes an energy economist, Peter Verleger, suggesting that it will have declined by as much 5.2 Mb/d, meaning that OPEC would have to reduce production by as much as 7 Mb/d to restore price. (There is nothing new about such a wide range of apparently authoritative oil data.)

The following countries currently belong to OPEC : Algeria, Angola, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, UAE, Saudi Arabia, and Venezuela. It was formed in 1960 to cut production in order to support price, following the example of the Texas Railroad Commission, which had performed a similar function in the United States in earlier years. The share of world production coming from these countries was 16% in 1930 and had risen to about 50% by the 1970s, when it faced competition from new offshore production in the North Sea and other areas, which caused it to fall back to about 40%. The entry of more deepwater and other *Non-Conventional* sources of oil, combined with falling world demand from recession, is here expected to hold its share at about this level for the next few decades.

This year's excessive surge in oil price, which approached $150 in July, is instructive. It suggests that such high prices, which are caused by brief speculative runs, prompt economic recession that cuts demand and takes pressure off price. Another factor was the devaluation of the dollar in which oil is quoted. It sounds as if OPEC ceases to have any particular relevance, save perhaps in helping to achieve short term corrections. It probably still costs the main OPEC countries no more than about $10-15 to produce most of their oil, so the balance at even $50 a barrel still represents a handsome reward. Price apart, these countries evidently have substantial incentives to hold production down to conserve as much of their resources as possible for their future, as King Abdullah of Saudi Arabia has already indicated. Indeed they may be hard pressed to find profitable investments for their surplus as the global recession builds momentum and destroys the traditional financial market system.

At first sight, oil prices seem set to surge in the years ahead as production heads into terminal decline, but on further reflection this may not be logical as there are several new interwoven threads of behaviour that affect the issue. The price uncertainty and volatility, combined with the credit crisis, must be adversely affecting the international oil companies causing them to delay or cancel projects. Furthermore, growing

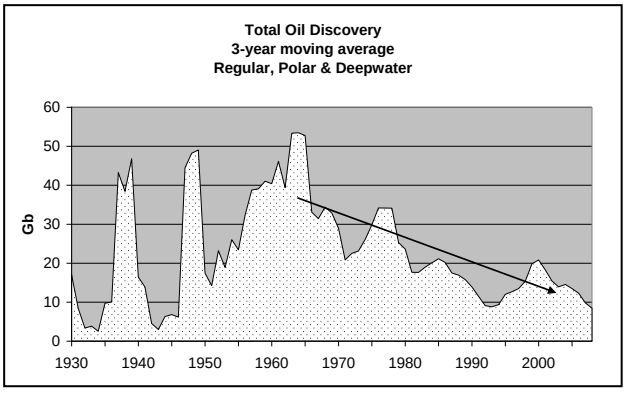
resource nationalism, as countries increasingly try to conserve their remaining oil and gas for their own use, cuts the amount available for world trade. These factors would tend to raise price, but they are evidently not strong enough to counter crumbling demand imposed be the worldwide economic collapse that truly does sound like The Third Great Depression, following those of 1870 and 1930. Governments are trying to restore the past position by pumping yet more money lacking genuine collateral into the system, evidently not having noted the axiom *" if you are in a hole, stop digging"*.

On balance, one might conclude that a price in the range of say $50-100 is sustainable in future years, with anything higher triggering steeper recession and thereby cutting demand. Speculators may be standing by to cash in on another surge if the world economy should stage a brief recovery, but they may be disappointed if they hope it will reach or exceed its previous maximum. That said, price is probably now at the lower end of the range, and it is hard to know what better they can do to preserve their funds if inflation grips in earnest being perhaps the easiest mechanism to remove all the false money the banking system printed without genuine collateral.

1111. Discovery Trend

Even the flattest of flat-earth economist would surely agree that oil has to be found before it can be produced. Since past discovery defines future production, determining the trend is of critical importance, but becomes ever more difficult. One reads for example that as much as 20 Gb have been found off Cuba, only to discover that this is no more than the hope of what might be found.

No particular scientific challenge is involved in estimating the size of an oilfield early in its life, although there is naturally a range of quantifiable uncertainty. Deciphering the reporting is another matter, especially in the new world of financial dishonesty. The first step is to define what is being measured, distinguishing the different categories of *Regular Conventional, Heavy, Deepwater, Polar, Gas and Gas-Liquids*. The second step is to assess the commerciality of the find. In earlier years, most international finds could be assumed to be commercial since only large prospects were drilled, but the United States Stock Exchange quite rightly set the strict rules long ago for what could be reported in that country. Its special situation, with the landowner owning the mineral rights, meant that the ownership of fields was fragmented such that relatively small units were produced separately. It made sense to recognise *Proved Reserves*, divided into *Proved Producing* for the estimated future production of existing wells and *Proved Undeveloped* for future production of as yet undrilled low risk infill wells. There was no particular concern about the commerciality of producing the oil in the environment of the United States. The industry also recognised *Probable* and *Possible Reserves*, mainly for that held in subsidiary reservoirs within a field, or for finds having some adverse characteristic, but they had little financial significance. The industry later adopted the concept of subjective probability that has its followers, recognising *high*, *low*, *mean* and *mode probabilities* with the so-called P_{50} value being generally treated as the best estimate.



In earlier years, the industry also maintained a world database with the informal help of the international companies. It reported honest best estimates, and routinely backdated any revisions to the original discovery. It differed markedly from what the companies reported to the Stock Exchange, whose rules were designed to prevent fraudulent exaggeration while smiling on under-reporting as commercial prudence. In practice they reported only as much as they needed to support their financial image. Such estimates were consequently subject to upward revision giving a comforting but misleading image of steady growth. The OPEC countries for their part exaggerated their reserves during the 1980s when they were vying with each other for production quota, based on what they reported. The Soviets also had their own system which tended to exaggerate.

The issue of commerciality evidently becomes much more relevant as the industry turns to ever smaller prospects in deeper water and more difficult circumstances. These problems are compounded by wide fluctuations in oil price, as experienced recently. The Stock Exchange is therefore right to insist that the investments be committed before the reserves can be claimed financially.

In short, it becomes ever more difficult to compile a valid discovery trend, especially as there no longer is a reliable industry database. But, that said, the downward trend of discovery, as illustrated above, is very evident. It is already in marked decline in virtually all the established provinces, including the known

deepwater areas. Even if a few new deepwater or polar provinces are discovered, their production, which will be both difficult and costly, is unlikely to have much impact on the downward global trend, which in turn exerts a major control on future production. It has been in decline for about forty-five years, and we have been in deficit since the early 1980s, now finding about one barrel for every three we consume, and the gap is widening.

1112. Crossing the Summit

The traveller, crossing a mountain range, climbs through the gentle foothills before reaching the craggy heights, which may be obscured in clouds, and then commences his descent into the plains beyond. The oil depletion profile matches such an analogy. It indicates that the peak of *Regular Conventional* oil was passed in 2005, being so-to-speak one of the higher foothills, but the production of costly oil from deepwater sources and tarsands provided a spur by which the traveller could reach the overall summit.

The Depletion Model has indicated that the overall summit of all types of production will be passed in 2008, and it begins to look as if the mid-year surge may indeed confirm this assessment. In this connection, it is well to remember that for every barrel produced, there is one less left for the future. It means that, whatever other short term factors are involved, it will become ever more difficult in the face of natural depletion to raise production in the future to reach, never mind surpass, past levels.

In other words, it looks as if we have indeed passed the long predicted inevitable peak of production as ultimately imposed by natural depletion. It is obvious that the production of any finite resource starts and ends, passing a peak in between. Given the central role of oil in fuelling the economic expansion of the past Century, it looks as if the *Second Half of the Oil Age* will be marked by economic contraction. Empires have waxed and waned throughout history so there is nothing unusual about the present pattern of events, difficult as the transition will undoubtedly be.

1113. Correction

Professor Aleklett has pointed out that Natural Gas Liquids have a lower calorific content than Crude Oil. The graph and table on Page 1 have accordingly been adjusted to report them as oil equivalent. It is satisfying to correct mistakes, and readers are encouraged to point them out.

1114. Another Confession

Item 1103 of the last Newsletter mentioned the real meaning of major oil company advertisements, referring to BP's statement that its initials stand for ***B****eyond* ***P****etroleum.* Shell too has adopted the same oblique advertising strategy with the following message:

Shell Advertisement

In the new energy future we'll need to think around the corners. As the global population grows and energy demand increases we need to get at some of the "difficult" oil trapped in sand, rock and the deepest seas. This will require breakthrough technology and innovations like our snake well drill invented to drill around the corners, which is now in operation in the oilfields of Brunei. To find out how Shell is helping to prepare for the new energy future visit www.shell.co.uk/realenergy

Seria, the largest oilfield in Brunei, was found in 1929 and contains approximately 1.7 Gb of oil and 1.5 Tcf of gas. Its oil production probably peaked at around 100 kb/d in the 1950s. A few other large fields were later found offshore, giving a total discovery of about 4.4 Gb, of which 3.4 have now been produced. The overall peak of production in Brunei was in 1979, and production is now declining at about 5% a year, as the prime reservoirs are depleted.

By all means, Shell deserves every credit for developing new methods to tap the remaining small nooks and crannies in the fields. The *New Energy Future* it contemplates is evidently one of dwindling supply. Every reservoir, every field, every country and the World as a whole is subject to depletion as exemplified by Brunei. Being a finite resource formed in the geological past, oil production must start and end, passing a peak in between. The overall pattern is set in rock, but naturally valuable efforts can be made to ameliorate the post-peak decline by tapping ever smaller and more difficult accumulations.

1115. Oil & Gas Journal Reserve Reports

The Oil & Gas Journal has maintained a database of oil and gas production and reserves by country for more than 50 years, and is widely regarded as an authoritative source of information. It has now issued its update for 2008. However, it is evidently becoming ever more difficult for it to obtain valid information. The total world reported reserves for 2008 are reported at 1343 Gb, up from 1331 Gb on the previous year, but

there are two serious shortcomings. The first shortcoming is the issue of the definition of what is being reported, nicely illustrated by Canada for which the Oil & Gas Journal reports 178 Gb, whereas the equally respected World Oil reports 25 Gb, evidently excluding the heavy oils from the tarsands. The second shortcoming is the fact that 73 of the 103 countries listed report unchanged estimates, some such estimates, including those of the major Middle East suppliers, being unchanged for many years. Production eats into reserves, and it is clearly implausible to suggest that new discovery or reserve revision should exactly match production. For starters, it would make sense to reduce year on year reserves by the intervening production.

If we remove 232 Gb for the heavy oils of Canada and Venezuela, 62 Gb for Deepwater, and say 50 Gb for Polar, it would reduce the estimates to about 1000 Gb. A further reduction, to take account of the many years of unchanged reporting by the major Middle East producers, would bring to world estimate close to the 736 Gb for *Regular Conventional Oil* as used in this Depletion Model.

The level of confusion on oil statistics is truly remarkable, and may have contributed to the current economic crash, given the central role of oil-based energy in the modern world

(Reference furnished by Seppo Kappela)

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.

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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)

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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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