

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

NEWSLETTER No. 87 – MARCH 2008

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 Australia, Austria, Belgium, Canada, China, Croatia, Denmark, Egypt, Finland, France, Germany, Hong Kong, Ireland, Isle of Man, Israel, Italy, Luxembourg, Japan, Korea, Malaysia, Mexico, Netherlands, New Zealand, Norway, 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”)

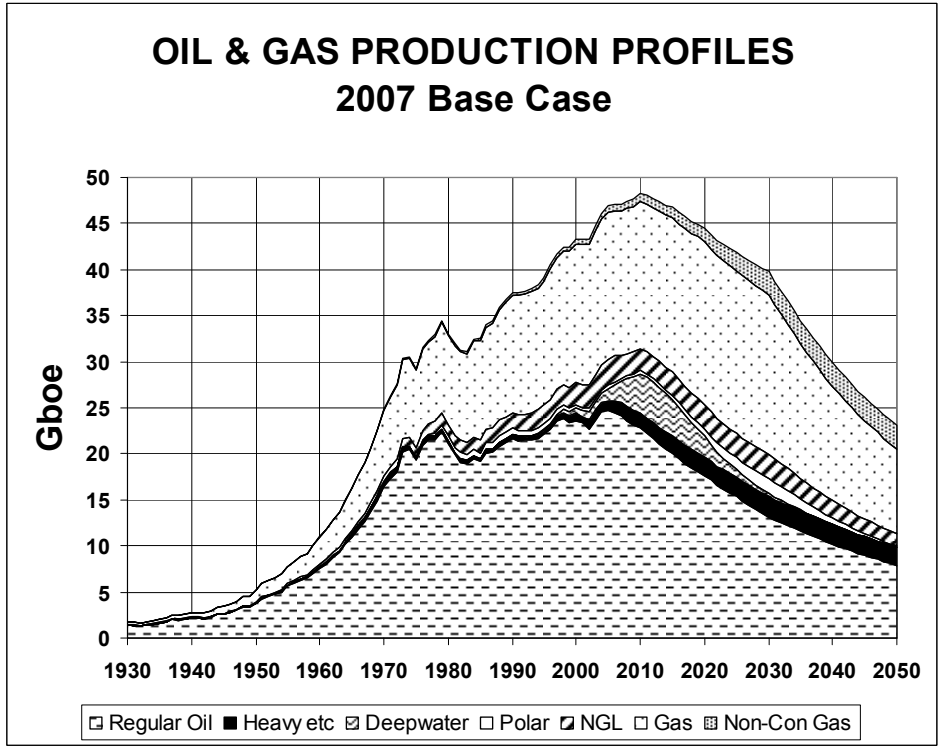
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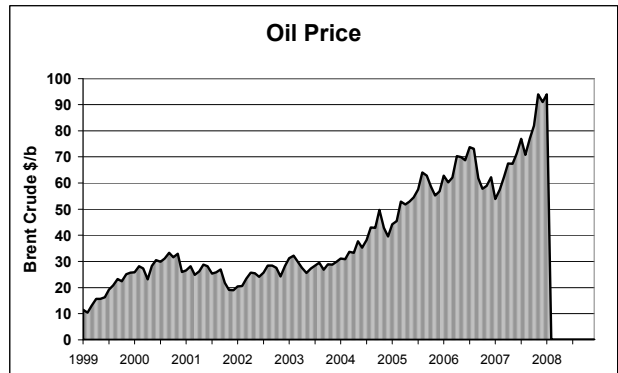
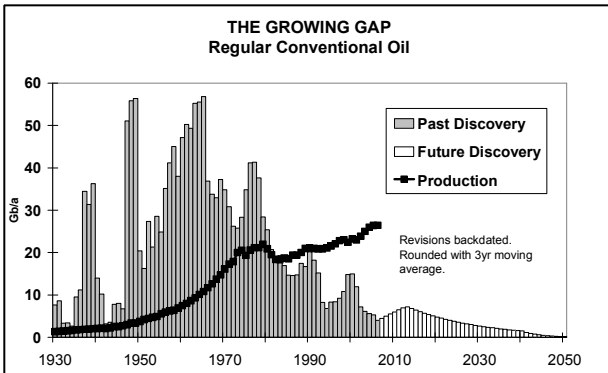
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The General Depletion Picture



ESTIMATED PRODUCTION TO 2100									End 2007		
Amount			Gb	Annual Rate - Regular Oil					Gb	Peak	
Regular Oil				Mb/d	2007	2010	2015	2020	2030	Total	Date
Past	Future	Total		US-48	3.7	3.1	2.4	1.8	1.0	200	1970
Known Fields	New			Europe	4.3	3.5	2.5	1.7	0.9	76	2000
1008	724	143	1875	Russia	9.7	9.7	7.8	6.2	3.9	230	1987
	867			ME Gulf	19	19	20	20	17	663	2015
All Liquids				Other	29	27	22	19	13	706	2005
1159	1341	2500	World		66	62	55	48	36	1875	2005
2007 Base Scenario				Annual Rate - Other							
M.East producing at capacity (anomalous reporting corrected)				Heavy etc.	3.9	5	5	5	6	184	2030
Regular Oil excludes Heavy Oils (inc. tarsands, oilshales); Polar & Deepwater Oil; & gasplant NGL				Deepwater	6.5	12	11	6	1	68	2011
				Polar	0.9	1	1	2	4	52	2030
				Gas Liquid	7.7	8	9	9	10	261	2035
				<i>Rounding</i>			-1	-1	-2	59	
Revised	07/02/2008		ALL		85	88	80	70	55	2500	2010



1012. Nuclear Power

Somehow, the issue of Peak Oil seems to raise passions, although it is really an easy concept to grasp. The glass starts full and ends empty: it is as simple as that. Furthermore it not particularly difficult to measure the size of the glass or the rate at which it is being emptied. The difficulties lie in ambiguous definitions and lax reporting practices.

But evidently there are additional psychological difficulties, comparable with those that led to the execution of Giordano Bruno on February 8th 1600 for having offended the Establishment by saying that the Earth revolved around the Sun and not vice versa. The modern Establishment is dominated by the flat-earth priests who maintain as an act of faith that market forces must deliver the needs of Man. This faith has certainly dominated the world over the past two Centuries, probably being responsible for two world wars of unparalleled severity, as countries competed for economic dominance. The hidden world of banking, driven by usury, short term-speculative trading and the fabrication of liquidity, plays a central part in the construction. The political parties of so-called democracies find themselves as little more than agents for this edifice, seeing no political advantage in questioning its viability.

But Nature begins to show her hand, imposing reactions upon the Establishment who gradually find that the advantages of denial begin to erode, as they can no longer avoid addressing their response to Peak Oil. While vested interests of all sorts may endeavour to postpone the date of Peak to lessen its impact, few now deny the inevitability of peak itself.

The first response seems to be to move to reduce the emissions from burning oil and other fuels on the grounds that they are adversely affecting the climate. One may be sceptical about the scale of man-made global warming given that there have been many such changes in the geological past, before Man set foot upon the Planet. Major volcanic eruptions in the distant past probably dwarfed the impact of the current exhaust pipe. Indeed 2007 apparently saw significant cooling with a fall of between 0.62 and 0.75°C. But be that as it may, moves to improve efficiency and use less of the remaining stocks of oil, gas and coal are certainly to be welcomed. The passions of the Environmental Movement are indeed having a positive influence.

Another item in hot debate is the scope for nuclear energy to replace dwindling oil, gas and coal supplies. It too has its passionate adherents and equally motivated detractors, some of whom fear irradiation from accident or military acts. Britain, for example, launches new nuclear submarines, which are depicted as defensive, when by their very nature they can only fire missiles. Pressures are applied on other countries to try to deter them from building a nuclear industry, as the peaceful uses can always facilitate military applications. But apart from these arguments and positions, there arises again the underlying issue of the resource base of fissionable material, principally uranium. An interesting paper on this subject has been produced by John Busby (www.after-oil.co.uk/nuclear). He states that the 439 nuclear power stations currently in operation require 66,500 tonnes a year of uranium. Apparently, the United States is the largest consumer, taking about 30% of the world's supply. But he reports that the prime grades are being depleted, with for example Canada's production having fallen by 15% in 2006. The adherents of nuclear energy speak of new technologies and of tapping less concentrated resources, echoing almost precisely the themes of oil companies when they speak of enhanced recovery or exploring the Arctic Ocean.

Without wishing to step in the footsteps of Giordano Bruno, the dispassionate observer may conclude that words are cheap and unlikely to have any material impact on the underlying progression of geological history that has been characterised by cycles. *Petroleum Man* will certainly be almost extinct this Century, but his successors may be able to enjoy their lives on their hilltops if the oceans rise. They may even wonder at the strange obese behaviour of their antecedents who spent their lives dashing into shops to buy superfluous items, and having their knees fondled by security guards before they took off in strange bird-like machines to fly to sunny beaches to drink and play with a ball. Priorities and circumstances change over history.

1013. Bush Telegraph

During his visit to the Middle East last month, President Bush made three references to what is tantamount to Peak Oil.

- 1) *"If they don't have a lot of additional oil to put on the market, it is hard to ask somebody to do something they may not be able to do."*
- 2) *"I hope that OPEC, if possible, understands that if they could put more supply on the market it would be helpful. But a lot of these economies are going -- a lot of these oil-producing countries are full out."*
- 3) *there is not a lot of excess capacity in the marketplace. What's happened is, is that demand for energy has outstripped new supply. And that's why there's high price."*

One can imagine that the leaders of the Middle East countries had been under pressure from the United States to increase production to reduce price and take the pressure off the dollar. They may have responded expressing the best of intent, but asked for forgiveness on the grounds that they simply had no spare capacity to produce.

It is noteworthy too that the International Energy Agency, which has been so long in denial, having internally identified Peak Oil some ten years ago, now finds that its masters in the OECD governments see advantage on raising an IEA umbrella for the policies they will be forced to adopt. The latest IEA Oil Market Report states : *Despite four years of high oil prices, this report sees increasing market tightness beyond 2010, with OPEC spare capacity declining to minimal levels by 2012.*

The oil companies too begin to abandon denial as the following words from Exxon's Chief Executive confirm

But for the foreseeable future, the world will be increasingly dependent upon the Organization of Petroleum Exporting Countries and the Middle East for energy.".....That's not an ideological or policy choice.. It is simply a reflection of where resources are to be found and how much energy will be needed to ensure continued global economic growth. There is very little that can be done to materially alter this reality with regard to conventional oil.

The Executive further states that he expects non-OPEC production of crude and condensate to peak in the next 10 years, with 70% of total production coming from seven areas—Russia, the US, the North Sea, Mexico, Canada, China, and Brazil. *(References furnished by Basil Gelpke and Sen, Bartlett's office)*

1014. Faulty Maths : it must be infectious

This newsletter has had to work so much with false reserve numbers and erroneous mathematics that it has evidently itself become infected by the disease. In Item 1001, it made a mistake in the calculations to illustrate the changing buying power. The concept was right but the maths was wrong. Someone earning \$20,000 in 1970 when oil was trading at \$3.18 (WTI) could have bought 6289 barrels with his salary. Today, when oil trades at say \$90 a barrel, he would have to be earning \$566,010 to buy the same amount. Some errors also appeared in the table on Page 2, which have been corrected.

The Oil & Gas Production Profile on Page 2 has been updated, following a more detailed country by country gas evaluation, suggesting somewhat a lower world total than previously indicated. Data on gas production and reserves are even less reliable than is the case for oil, and the trends are less clear. The resulting analysis is accordingly far from sure and will no doubt be subject to further revision as more information and insight come in.

Thanks are due to several readers for pointing out the mistakes. Indeed, the underlying depletion model is far from sure: the challenge is to spot the weak points and try to correct them.

1015. Deepwater Brasil

More information on the deepwater finds off Brasil becomes available (See Item 994). British Gas, a partner in the project, has released information stating that the Tupi discovery, which underlies a great thickness of salt at a depth of some 5000m contains 12 to 30 Gb of oil and gas in place (with gas quoted in terms of calorific oil equivalent). It mentions that the oil has a gravity of 28° API, which is surprisingly low for the high temperatures to be expected at that depth. At a guess, one might hazard that about 30% of the deposit is oil and that 40% would be recoverable. If so, it might yield between 1.4 and 3.6 Gb of oil. The operating conditions are extreme, and after further appraisal, a full-scale floating production system may be in place within about seven years. Producing the gas poses even more challenges.

(see www.investis.com/bgir/results/2007).

It was undoubtedly an important discovery opening a new very exceptional province, but it will not be cheap, and the Brazilians would be wise to conserve the production for their own use.

(Reference furnished by John Lyles)

1016 ASPO-ITALIA

The second national conference of ASPO Italy will be held in Torino, Italy, on May 3rd of this year. The conference will be mainly in Italian, and, unfortunately, the budget doesn't run to simultaneous translation. Nevertheless, the guest of honour this year will be Euan Mearns of The Oil Drum, who will speak in English about Europe's gas security. The other speakers will examine subjects such as *Peak Minerals*, the financial petroleum market, electric vehicles and the social and political consequences of peak oil. The web page of the conference is (<http://tinyurl.com/ys67yx>). Attendance is free.

1017. *The Bubble Bursts*

One imagines that the Wall Street Journal is a prime gospel for the Establishment. It is therefore very significant that it gives increasing space to the Peak Oil issue. One of the first articles to depict the true position, despite a somewhat dismissive title, was that by J. Ball *As prices soar, doomsayers provoke debate on oil's future* (21 Sept 2004). Another strong, if oblique, reference comes in a fairly lengthy article by Neil King Jr *Preparing for the Worst Oil Shock* (28 Jan 2008). It describes the reaction of someone who wakes up to reality and begins to make personal plans to meet the consequences of Peak Oil in Middleville, Michigan, which sounds like heartland America.

Still another very perceptive article appears in the January 31st issue entitled *Big Oil's Not-So-Big Growth Plans*. It reviews the performance of the major companies, which are failing to replace reserves by exploration. It points out that the practice of share buy-back is tantamount to progressive liquidation,

It does not appear that Peak Oil has yet become a theme for any of the candidates hoping to contest the forthcoming Presidential election, although they have been informed. Perhaps they are holding it in reserve for a final salvo. Some could use it to justify further military action to capture Middle East oil; whereas others may use it add criticism to the previous regime and come forth with domestic solutions, offering to reduce overseas campaigns. An attack on Iran would likely more than double the price of oil, but ironically it might serve some useful purposes : it would leave more oil in the ground for the future; it would jolt the consumers into using less; and it would give the politicians the ammunition with which to introduce much needed new policies by which to face the *Second Half of the Age of Oil* when oil and all that depends on it contracts. Such an attack would likely cost the lives of millions, and so it is to be hoped that the Wall Street Journal's message will lead to a gentler solution.

The Wall Street Journal is not alone in recognizing the new reality. A brilliant leading article by Martin Jacques in the Guardian of February 18th analyses the collapse of a British bank seeing it as a symptom of an unfolding situation. It significantly opens by recalling the economic recession triggered by the oil shocks of the 1970s, and rightly sees the present one as something far more fundamental, saying that *it will burst the bubble of free market doctrine*, being triggered by *US economic decline and its new weakness at the apex of the global financial system*.

To state it again at its simplest : the banks have been lending more than they had on deposit accepting *Tomorrow's Expansion* as collateral for *Today's Debt*, without recognizing that the cheap oil-based energy, which made the expansion possible, was subject to natural depletion. As the Guardian article points out, the world now faces contraction not expansion, and a radical consequential shift in the political power structure. It seems that the days of US economic hegemony are over: its industry relocates to benefit from cheaper labour overseas; its currency devalues; and its destiny is increasingly in the hands of foreign sovereign wealth funds. The article ends with the words: *Remember we are only at the very beginning of the biggest geopolitical shift since the dawn of the industrial era*.

1018. *Peak Oil Video Game*

ABC News reports on the production of a video game that has been produced by KAOS Studios in New York at a cost of \$15 million. It is entitled *Frontlines: Fuel of War* and covers the Peak Oil issue, envisaging a post-peak war between China and Russia on one side and the United States and Europe on the other over the control of Caspian oilfields. (*Reference furnished by Mikael Höök*)

1019. *Mr Lawson's awakening*

Mr Nigel Lawson, who was Chancellor of the Exchequer under Mrs Thatcher's government of Britain during the 1980s, was one of the architects of an oil policy that encouraged the rapid depletion of the country's oil and gas. At a conference in London some ten years ago, he responded to a question by saying that he had been informed of the impact of depletion, but had rejected the words of warning with derision, being confident that new technology and market forces would resolve all.

He now expresses concern that Britain faces a serious energy crisis, calling for new government action. Britain got through half of its oil at a time of low world oil prices, which stimulated demand as its crowded streets and consumeristic life-style demonstrates. It was even exporting much of its priceless endowment. Now, it faces soaring imports at prices five to ten times higher than those of its earlier exports. The flattest of flat-earth economists must surely question the wisdom of such a strategy; and it is indeed encouraging to note the new position of Mr Lawson.

1020. Queensland Government reacts to Peak Oil

The Queensland Government of Australia has evidently accepted Peak Oil and plans to prepare for the consequences

**Minister for Sustainability, Climate Change and Innovation:
The Honourable Andrew McNamara, Friday, February 08, 2008**

Government Strategy to Reduce Oil Demand

The State Government is to develop a strategy to help Queenslanders lessen their reliance on liquid fossil fuels as the price of oil increases and supply diminishes.

Minister for Sustainability, Climate Change and Innovation, Andrew McNamara, said the future availability of fossil fuel and alternative energy supplies is one of the main sustainability issues facing society today.

“The significance of this issue means that Queenslanders and people all around the world will need to address the increasing price and diminishing availability of oil in coming years,” Mr McNamara said.

“By developing a strategy sooner rather than later, the Queensland Government can work to protect the lifestyle of Queenslanders and their need to travel, without needlessly damaging the environment.

“During the past two weeks, the head of General Motors said world oil production had already peaked, and the head of Shell Oil said the supply of easily accessible oil will be exhausted within seven years.

“These are voices the world can’t afford to ignore.”

Mr McNamara, who is the Australian patron of the Association for the Study of Peak Oil, completed a report on peak oil before his appointment as a Minister in September.

‘Peak oil’ refers to the time when global oil production declines due to natural exhaustion of the resource, which will lead to shortages and significant price increases.

The Government’s decision to develop a Queensland Oil Vulnerability Mitigation Strategy and Action Plan was a key recommendation of Mr McNamara’s report.

Mr McNamara said that Queensland’s Oil Vulnerability Mitigation Strategy will look at a range of actions.

“The strategy will have three broad elements: reducing the consumption of liquid fossil fuels; encouraging the development and use of alternative fuels; and preparing for demographic and regional changes as Queenslanders alter travel, work and living habits in response to rising fuel prices.

“The Queensland Government is already doing related work across a range of departments, and the strategy will help to better coordinate these activities across government.

“The strategy will also look at the gaps to see what else needs to be done to ensure Queenslanders can still easily travel around the State and around their towns when required.”

Mr McNamara said the strategy could also canvass what options might need to be considered in a ‘worst case scenario’ of severe international oil shortages.

(Reference furnished by Bruce Robinson)

1021. Demand Destruction

The Canadian Imperial Bank of Commerce (CIBC) got it right already in 2005 when it asked how high oil prices would have to rise to cut demand to match the ineluctable level of supply as imposed by natural depletion.

"Over the next five years, crude prices will almost double, averaging close to \$77/bbl and reaching as much as \$100/bbl by 2010... Tomorrow’s price hikes won’t be triggered by sudden supply disruptions like the Arab oil boycott of 1973 or the Iranian Revolution in 1979. Instead, they will follow from the inevitable collision between surging global crude demand and accelerating depletion of conventional crude supply. By 2010, prices will have to take out nearly 9 million barrels a day from world oil consumption—no mean feat for a world that has never been more thirsty for oil.....

Chris Skrebowski, Editor of the *Petroleum Review*, takes up the question of asymmetric pricing in the February issue. All the major exporters provide their own people with relatively low priced oil. This can be described as a subsidy although in a sense it simply spares their people from national profiteering on world markets. If oil in Venezuela costs, say, \$15 a barrel to produce, or in other words, 36 cents a gallon, the State company could still make a handsome profit marketing it at say \$1 a gallon. It follows that the burden of cutting demand to match world supply will fall on the importers. They may indeed resent the profiteering from shortage by the producer, but what can they do? Maximizing profit is central to modern market economics, being the object of virtually all enterprises and it matches the mindset of the consumer as he searches for the bargain. The consumer in the importing country can respond by finding ways to use less and be more efficient. Pressures may mount on their governments for intervention. They could invade a producing country by military means so as to participate in the profiteering; or they can reduce imports by a mechanism such as the Oil Depletion Protocol. The reduced imports could be rationed to their people in some equitable manner. So far few are courageous enough to rise above doctrinaire market economics, but there are signs of change as Nature shows her hand.

1021. Revised Country Assessment - Norway

It is perhaps time to update the assessment of Norway which was last covered in Newsletter 25 of January 2003, in view of its growing importance as a source of oil and gas for Europe.

Norway

Norway is a rocky and mountainous country at the northern limit of Europe. It covers an area of about 325 000 km² with a long, highly indented coastline, crossing the Arctic Circle. The distance from its southern tip to North Cape is as far as to Rome. It also administers Svalbard (Spitzbergen), an Arctic archipelago, under a League of Nations mandate. Its shores are washed by the North Sea, the Norwegian Sea and the Barents Sea in the north, and it has common frontiers with Sweden, Finland and Russia. It is a sparsely populated country of 4.7 million inhabitants, about one-quarter of whom live in the vicinity of Oslo, the capital.

Norway was already occupied some 14 000 years ago by hunters emanating from Europe. Later, came more settled communities who fished the lakes and fjords and sustained themselves with difficult agriculture. They were isolated communities under petty kings and warlords. The Viking era, with an advanced culture, followed during the first millennium, when warriors in longboats headed south to colonise and trade, as well as to rape and pillage. The Norwegian Vikings went westwards to Iceland, Greenland, the Shetlands and Ireland, where they established settlements, while their Danish cousins settled Normandy. It is thought that some even reached North America, while others from Scandinavia headed east through Russia to reach the Black Sea.

Harold I succeeded in unifying the Kingdom in the 9th Century, but dissent amongst his successors led to fragmentation, with the country falling at different times under the control of the Danish and Swedish kings until 1297, when it became a province of Denmark. The Black Death pandemic decimated Norway's population during the 14th Century, thanks perhaps to a particularly active rat, called *ratus norvegicus*, which was later well-known to seamen and infested the New World.

Denmark had been ally of France in the Napoleonic wars, and on defeat in 1814 was forced to cede Norway to the Swedish king, but this was opposed by the Norwegian people who wished for independence. Various conflicts and disputes with Sweden occupied the 19th Century as a growing wave of nationalism built momentum, in part stimulated by a cultural flowering, as exemplified by the famous author Ibsen, and the rediscovery of the ancient Norwegian language and folklore. Finally in 1905, an independent kingdom was declared with the crown being offered to Prince Carl of Denmark, who became Haakon VII. The First World War soon followed but the Scandinavian countries, including Norway, were able to maintain their neutrality.

The inter-war years saw the gradual development of fisheries, canning and shipping. Norway's great hydro-electric potential was tapped, being used particularly to refine aluminium, and produce synthetic agricultural nutrients in a development of great significance for Europe. Even so, life was hard, leading to emigration to the New World, as well as a growing spirit of egalitarian co-operation at home.

Norway was victim on an unprovoked German invasion on 9th April 1940. It was forced to surrender after a short struggle, but not before the curator of a museum on the mouth of the Oslo fjord had managed to cause the sinking of a battleship by firing an ancient canon. The King escaped to England to establish a government in exile, while a puppet Nazi regime under Vidkun Quisling was established in Oslo. An active Resistance movement throughout the country contributed to the eventual liberation on May 8th 1945, but was unable to prevent the retreating Germans from destroying several towns in north Norway under their *scorched earth* policy.

Post-war reconstruction was built on the already well-entrenched co-operative spirit, with virtually all aspects of national life being under heavy government control. The shipping industry was rebuilt, partly with generous tax treatment, giving rise to several dynasties. They conquered world markets with capitalistic drive, but changed their coats in home waters to become unostentatious and responsible patrons of their communities. Socialist governments, built more on co-operation than envy, dominated the post-war epoch.

If anyone in Norway thought about oil at this time, they pictured the sands of Arabia, little imagining that the stormy waters of the North Sea might one day give them a key oil position. Few noticed the first hint when a communications failure led to the unintended deepening of a well in Holland in 1957. It found gas derived from deeply buried coal in an unlikely Permian reservoir, yielding the giant Groningen gasfield. It in turn attracted attention to the adjoining waters of the southern North Sea, which was soon to be rewarded with a string of gas fields extending into British waters.

Not long afterwards the European office of Phillips Petroleum of Bartlesville, Oklahoma, turned its eyes north to wonder what the northern North Sea might offer, opening talks for exploration with Norway. At that time, jurisdiction extended only three miles from the shore, so the countries bordering the North Sea had to decide how to divide it. At first, ever fair Norway opposed the notion of a median line on the grounds that it would give a disproportionate share of the mineral resources to the coastal States at the expense of the inland countries. Britain, with fewer scruples, pressed for a median line solution, eventually winning the support of Norway that itself was bounded by a deep trench, which would have deprived it of the prospective tracts if water depth alone had been taken into account. By this thin thread hung the chain of events which would eventually deliver untold wealth to Norway, making it one of the world's largest exporters of oil and gas.

The first concessions (licences) were awarded in 1968 covering the southern part of the shelf. One of the first wells to be drilled was 2/11-1 by the Amoco Group. It was searching for deep gas under geological conditions similar to those in the southern North Sea but to everyone's surprise encountered oil indications in Cretaceous chalk. This normally impermeable formation, made famous by the *White Cliffs of Dover*, had not been regarded as a possible oil reservoir. A

few months later, the Phillips Group drilled an adjoining block and fell into the giant Ekofisk Field, with its Chalk reservoir. As later knowledge revealed, it was indeed almost a miracle of Nature depending on a remarkable geological combination. A thick pod of Upper Jurassic oil source rock at a depth of peak generation is overlain just here by a special type of chalk that was laid down as a slump under conditions that preserved its original porosity. Norway had become an oil nation.

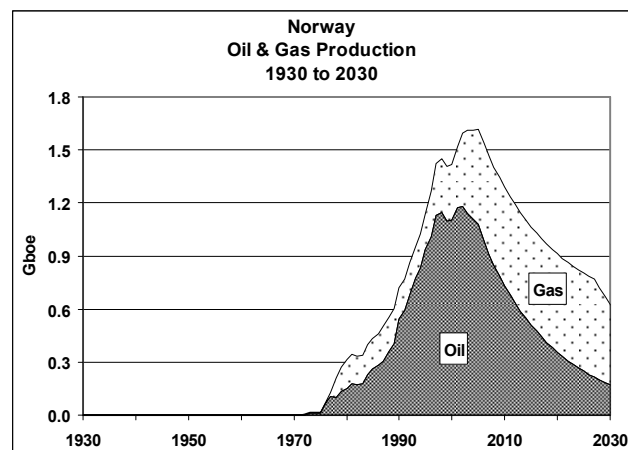
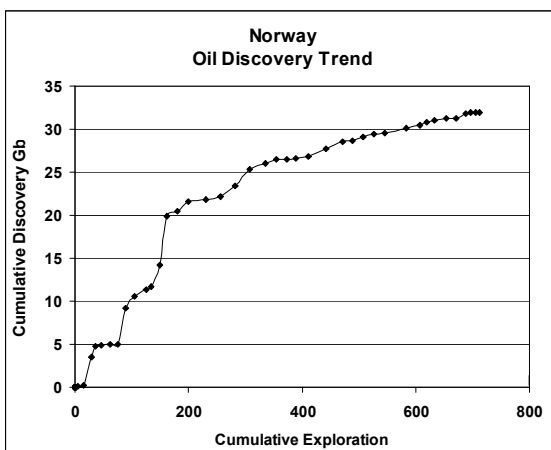
The next milestone came when Shell discovered the Brent Field in 1971 in the British sector of the northern North Sea, as improved seismic technology led to the identification of Jurassic troughs beneath the younger sediments. The field lay on a structural trend extending into Norwegian waters, where a huge structure was soon identified, yielding the Statfjord oilfield in 1973, which remains to this day the largest North Sea oilfield with over 3.5 Gb (billion barrels) of oil.

Norway reeled at the prospect of unimaginable wealth, and soon began to re-examine its oil policy, rightly fearing that oil might undermine its carefully balanced economy and society. To that point, the concessions had been granted on the basis of a normal royalty and corporation tax, but now the country moved to toughen its terms while respecting, in its ever-honest fashion, the rights already granted.

Britain had already created a State Oil Company under its then socialist government, which set an easy precedent for Norway to follow. Den Norske Stats Oljeselskap (or Statoil) was established under what at first sight seemed a highly advantageous arrangement, whereby it would hold a mandatory 50% in all concessions, with its exploration costs being met by the foreign companies, while it retained the right to increase its share to as much as 85% in the event of success. A special oil tax was also introduced. The world price of oil was soaring at the time in response to the oil shocks, and the industry accepted these outrageous terms not wishing to be left out of what was rightly perceived to be one of the world's last great oil provinces. The Norwegians earned the sobriquet of being *blue eyed Arabs*. But all was not what it seemed, for the companies' ever-ingenious tax lawyers soon found that they could take the cost of carrying Statoil as a charge against their taxable income. So, at the end of the day, it was the long-suffering Norwegian taxpayer who met the cost of the creation of the State Company, which started to burn up national wealth at a prodigious rate. It now employs more than 11 000 well paid people. It subsequently acquired the oil interests of Saga and Norsk Hydro, two other major Norwegian enterprises.

The Norwegian Petroleum Directorate was established to run exploration, deciding which companies would work together as groups; which prospects would be drilled and how many commitment wells were to be imposed, effectively treating the foreign companies as if they were contractors. But the companies did not object as the cost of all of this was taken as a charge against taxable income under terms that meant they were effectively spending *10cent dollars*, enjoying a colossal unseen subsidy.

At first, the government moved with admirable caution so as to accommodate the new industry into the economy. New licensing was delayed until 1979, when a number of prime prospects were awarded yielding a string of giant discoveries to the north and east of Statfjord. But with the passage of time, the early caution was abandoned as the country succumbed to the political pressures of new Norwegian rig owners and contractors, who sought rapid expansion, and as the people at large began to develop an unquenchable thirst for wealth, a departure from the attitude of their somewhat Spartan, God-fearing antecedents.



During the 1980s, exploration moved to the northern shelf. A basin with similar geology to the North Sea was identified at Haltenbanken, off mid-Norway, eventually yielding some 10 Gb of oil, but the huge expanses of the Barents Sea turned out to have limited potential. A narrow, classic prospective Jurassic rift was identified on the western margin but the geology elsewhere was generally unfavourable. In part, this was due to large vertical movements of the crust under the weight of fluctuating ice caps in the geological past that had depressed such source-rocks as are present into the gas-window and destroyed seal integrity.

In short, the bulk of Norway's oil had already been found by the early 1980s, and what has followed has been little more than a mopping up operation to find and produce ever smaller accumulations. This unwelcome reality is however countered by optimists who continue to believe in exploration, drawing attention to the vast size of the Norwegian shelf, and dream that technological progress might extract more oil from known fields. Some improvement in recovery has

indeed been achieved in the difficult chalk reservoirs, for which there was plenty of scope as very low recovery factors of below 20% were at first assumed. For a brief moment, it seemed that Statfjord could recover as much as 70%, setting a precedent for other similar fields, before it was realised that the complex east flank also held large amounts of oil-in-place, returning the overall recovery factor to about 45%. Some of the more recent small fields are giving disappointing results, as companies were forced to make optimistic assessments to justify development at all. The licensing terms have been progressively ameliorated to match the dwindling oil prospects, and to keep the exploration business alive. Recent years have seen the proliferation of small promotional oil companies, mopping up tail-end production and minor outsteps around existing fields, which have become profitable in a high oil price environment.

Oil production commenced in 1971 and grew steadily to peak at just over 3 Mb/d in 2001, before declining at a relatively high rate of almost 7% a year, which is likely to continue, reflecting the high efficiency of the operations. Some 22 Gb have been produced out of an estimated total of 33 Gb. The golden days of Norwegian oil are accordingly coming to an end, but a new chapter of gas production has opened, calling again for clear thinking government policy. The gas was generated mainly from the axial regions of the North Sea and the northern basins, where the same prolific Upper Jurassic oil source rocks have been depressed into the gas window, but has migrated to marginal areas. Older sources may also be present in the Barents Sea, comparable with those found in northern Russia. The Troll Field on the northeastern margin of North Sea, was a major gas discovery in 1979, holding some 47 Tcf, and has been followed recently by Ormen Lange, with some 13 Tcf in a comparable geological setting to the north. The Barents Sea has yielded the Snoevhit Field with some 6 Tcf, which is being liquefied for export on a nearby island.

Some hopes have been expressed for new discovery in the deep water Atlantic Margin province that flanks Norway and the British Isles. The probability, however, is that the critical Upper Jurassic source-rocks are, at best, only locally present, and, even where present, too deeply buried to yield oil, save in some freak occurrences where re-migration from earlier accumulations has occurred. The province may have considerable gas potential, but with so much other more accessible gas available is unlikely to be of interest for a long time to come.

The total endowment of gas is estimated at about 150 Tcf, of which 45 Tcf have already been produced, leaving about 10 Tcf for future discovery. Gas production reached a plateau of about 1 Tcf a year during the 1980s and early 1990s before rising to triple that rate to-day with the construction of new pipelines, including an export line to Britain. Some 30% of its endowment has now been produced, and it would make sense to hold production at this level for around twenty years until 70% has been taken, which would be followed by a steep decline. But that carries geopolitical risks as it is never easy to be a rich man in a crowd of beggars, Europe becoming increasingly desperate for Norwegian gas to counter the stranglehold of Russian supply.

With hindsight and a realisation of inevitable depletion, it might have been a better policy for Norway to have used its State Company to develop its oil and gas much more slowly itself, having said goodbye to the foreign companies after thanking them for their pioneering contribution. It has instead placed \$250 billion, derived from the proceeds of rapid depletion, in a so-called Oil Fund, invested overseas in financial markets, whose value may now decline in the deepening recession. Oil and gas in the ground might have proved a much better asset.

Norway was invited to join the European Union in 1994, but wisely declined after a referendum. Nevertheless it voluntarily complies with much European legislation, not wanting to find itself isolated. It has been an enthusiastic member of NATO, having had a common frontier with the former Soviet Union, and it has contributed greatly to various UN peace-keeping missions.

In general, Norway's politics have moved to the right in recent years. Its electoral system however tends to give rise to coalition governments in which small parties may find themselves with a disproportionate power.

The next generation will have to face a new situation being denied the massive oil-based affluence of their parents, but they will not be too badly placed with much hydro-electric power as well as potential for wind and tidal energy. The population is likely to remain relatively small if immigration is controlled, and can find a sustainable future, despite the northern climate. It is not however too soon to start planning for the radically changed circumstances of the not too distant future when its remarkable oil age comes to a close.

NORWAY		OIL	GAS
		Mb/d	Tcf/a
Consumption	2006	0.21	0.15
Production	2006	2.49	3.1
Forecast 2010		1.86	3.1
Forecast 2020		0.9	3.1
Discovery 5-year average (Gb)		0.14	1.9
Amounts		Gb	Tcf
Past Production		21.7	45
Reported <i>Proved Reserves</i>		6.87	84
Estimated Future Production		11.3	106
From Known Fields		10.7	95
From New Fields		0.6	11
Past and Future Production		33	150
Current Depletion Rate		6.8%	2.8%
Depletion Midpoint Date		2002	2021
Peak Discovery Date		1979	1979
Peak Production Date		2001	2018

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.

2008

April 15th – Peak Oil Debate : Geological Society, **London** [Campbell]

May 3rd – Conference : ASPO ITALIA, **Torino** [Bardi]

May 24th – Meeting : ASPO Switzerland, **Basel**.

August – Geological Conference, **Oslo**, Norway [Campbell, Laherère]

NOTE

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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.