

Are we facing Peak Gas?

Malcolm Brown, BG Group

Peak gas and the permanent decline in gas production, is likely to become as emotive an issue as the current peak oil debate. World demand for gas is rising and increasingly it is being used to substitute fuel oil for both industrial and domestic use. The World's current proven reserves of gas total 6400 tcf, which will last around 63 years at current consumption levels (101 tcf/yr). Probable and possible resources add significantly to this. Historic and forecast demand for global energy from 2004 to 2030 shows a compound annual growth rate of 2.0% for gas. Almost 2/3rds of this increase is driven by the industrial and power generation sectors. Three primary factors have driven the increased use. (1) Improvements in the efficiency and operation of combined cycle gas turbines, combined with a desire to lower CO₂ emissions, have driven use of gas in power generation. (2) High oil prices have supported the internationalisation of gas markets, via LNG or long distance pipelines, (3) Production technology, especially for unconventional gas, is improving gas recovery.

Can future gas supply keep pace with increasing demand? On a technical basis this is likely. Many of the World's petroleum basins have been explored primarily for oil, and gas exploration is relatively immature. An increasing percentage of associated gas is being developed rather than flared (in 2003 3tcf was flared). Production from coal bed methane and shale gas projects is increasing, due to improvements in drilling, fracturing, and completions technology and higher average gas prices. Unconventional gas currently contributes 30 - 40% of US gas supply.

Global gas reserves are abundant however, these are unevenly distributed. Russia, Iran and Qatar hold more than 55% of proven gas reserves. Sovereign states will produce gas for domestic or export use, according to their best interests. Aligning the interests of governments, NOC's and IOC's and promoting effective investment in developing the gas-chain, will determine the resource that can be economically produced and when this will happen.

Rising demand for gas, which is a viable bridge fuel between fossil fuels and sustainable energy, will stimulate exploration and production for both conventional and unconventional gas. Peak gas is not forecast in the near future and is unlikely to be driven by ultimate available resources. Instead, a combination of supply and price, global politics, climate change concerns and the timing of newer technologies will all influence the ultimate timing of peak gas.

Malcolm Brown
Senior Vice President, Exploration, BG Group

Malcolm Brown is Senior Vice President, Exploration, with worldwide responsibility.

After completing his BSc Geology in 1976, Malcolm worked initially in Libya and Saudi Arabia. He took his MSc in Petroleum Geology at Imperial College in 1982 and joined British Gas. During his career he has worked in a variety of hydrocarbon provinces including the North Sea, West Africa and South America, based in the UK and Houston. He was Exploration Director from 1996 to 2000. In this period BG had major discoveries in Egypt, Kazakhstan, Trinidad, UK, Bolivia and Indonesia.

Between 2001 and 2003 he managed BG's Central North Sea production assets and then spent two years as Group Head of Health, Safety, Security and Environment. Malcolm returned to lead Exploration in 2005 and currently manages BG's global exploration portfolio in 20+ countries. He is also responsible for all geoscience activities ranging from exploration through to production.

Recognising the Oleocene

C.J.Campbell, Association for the Study of Peak Oil & Gas

The founders of the Geological Society were some of the fathers of geology. They did great work, but the result was a mixed blessing insofar as geological skills accelerated the depletion of the World's oil and gas, which are finite resources formed in the geological past under well understood processes.

Settled agriculture came only 10,000 years ago when *Homo sapiens* became the first species ever to rely on energy beyond that supplied by his muscles. He also became the first species to trade, at first by barter but later through the medium of gold, which led to a financial system of currency, debt and usury. The Industrial Revolution was born on the back of coal-based energy, and grew greatly with the arrival of oil and gas, allowing the population to expand six-fold in parallel. It spawned flat-earth economics which assumes limitless resources and eternal economic growth.

Geologists have a new mission to identify the Oil Age (or *Oleocene*) and evaluate the true status of depletion. The situation would be self-evident were reliable information in the public domain which is far from the case. Accordingly, it is necessary to define what to measure, as there are many different categories of oil and gas; decipher false reserve reporting; and then relate discovery and production trends.

Oil has to be found before it can be produced, meaning that the peak of discovery, which occurred some forty years ago despite an intensive effort and great advances in technology and geological knowledge, must deliver a corresponding peak of production. In fact, the evidence suggests that the world peak of *Regular Conventional Oil* was passed in 2005, and that the peak of all liquids will follow around 2010, to be followed by a decline at 2-3% a year. Gas, being a gas not a liquid, has a different depletion profile normally giving a plateau ending in a cliff. A debate rages as the precise date of the peak but rather misses the point when what matters – and matter greatly – is the vision of the long slope that comes into sight on the other side of it.

In short, the First Half of the Oil Age, which was a most remarkable chapter in history, comes to an end. The Second Half will be characterised by the decline of this critical energy source, which drives the modern world. The decline slope is gentle but the transition from economic expansion to contraction comes as a shock, with far reaching financial consequences as debt has been premised on expansion.

Much can be done to ameliorate the situation. For example, Governments could agree a Depletion Protocol whereby importing countries cut imports to match world depletion rate (annual as a percent of future production). It would prevent profiteering from shortage, and encourage consumers to cut waste and tap renewable energy sources. Time is short, and the longer policy decisions are delayed, the more severe the consequence. The transition promises to be a time of great tension and radical change, underlining the importance of the Geologists' new mission to explain that it is imposed by Nature and will not be solved by invading oil producing countries.

Petroleum Man will be extinct by the end of the Century, posing the question of whether *Homo sapiens* will be as wise as his name implies and avoid the fate of many over-adapted species in the geological record which died out when their environmental niche collapsed.

Colin Campbell

The Association for the Study of Peak Oil and Gas

Born in 1931, Colin Campbell took a degree in geology at Oxford in 1951 before going on to a D.Phil in 1957 based in field work in Connemara and central Borneo.

He then joined the oil industry and had the following career

1958-62: Field Geologist, Trinidad and Colombia, with Texaco

1962-66: Regional Geologist, Colombia with BP

1967: Field Geologist, New Guinea with BP

1968-69: Regional Geologist for Latin America with Amoco in New York and Chicago

1969-72: Chief Geologist, Ecuador with Amoco

1972-77: General Manager for European operations with Shenandoah Oil

1978: Exploration Manager, Aran Energy, Dublin

1979: New Ventures supervisor, Amoco, London

1980-85: Exploration Manager, Amoco, Norway

1985-89: Executive Vice-President, Fina, Norway.

1990-present Various consulting assignments to Governments and Oil Companies.

Several scientific papers were written, especially on Latin American geology.

Interest in oil depletion was sparked by a study of Colombia in 1966 and a world evaluation in 1969. It became a major interest following "retirement" in 1989, leading to the publication of five books on the subject, numerous publications, and more than 100 lectures, as well as media interviews, including radio and TV. He was founder of The Association for the Study of Peak Oil and Gas ("ASPO") which now has associates on 36 countries.

Peak Oil: A Metaphor for Anxiety

Michael C Daly, BP plc

Energy security and man's impact on climate are genuine sources of anxiety in society today. Concerns over energy security arise due to the imbalance between the ownership of conventional oil and gas reserves and their markets. Consumers worry about supply; producers about demand. Shocks to both parties have fuelled these concerns.

On this history of uncertainty, the escalation in Asian oil demand growth and disruptive political events have heightened the concern over oil security and seen the price rise dramatically. These events have led to the re-emergence of anxiety that we may be running out of oil and that oil production may peak and collapse, destroying our current way of life.

Today the oil industry produces more oil, more efficiently than ever before. To date about 7 Trillion barrels (Tbbl) of conventional oil in place has been discovered. Of this, the world has consumed about 1.1Tbbl and has about 1.3Tbbl economically recoverable worldwide. This implies an average recovery of about 34 percent. A 10 percent increase to recovery through technology advancement could add a further 0.7Tbbl.

In addition, exploration continues to find new oil in increasingly more difficult and challenging places. Continuing the search into ever deeper water and the arctic regions will continue to yield new oil for years to come.

Augmenting this conventional resource there is a broadly equivalent volume of unconventional oil, categorised as Heavy Oil, Shale Oil and Oil Shale. Of the estimated 7Tbbl in place, some 2.5Tbbl are thought to be recoverable. A further source of unconventional liquids can come from the conversion of gas and coal, albeit at significant carbon and financial cost.

Given this wealth of resource, the peaking of oil supply occurs as a the metaphor for a much deeper concern - that of the world's rapidly growing market facing a decreasing geographic diversity of the sources for oil. Oil reserves, and the majority of the oil to be discovered, are held by a very few States. Incremental oil outside of these States, lies on the technological frontier and is both expensive and carbon intensive.

Our ability to invest in and develop new resources to create sustained diversity of supply depends on constantly extending the technology frontiers and on new access. This latter issue hinges more on the surface risks of politics and ownership of natural resources than on geology. It remains the crucial element to the world having access to oil and mobility, peacefully and without conflict.

Dr. Michael C Daly
Group Vice President for Access and Exploration



Dr Michael C Daly is BP's Group Vice President for Access and Exploration. He is accountable for the leadership of BP's exploration programme and the long term replacement of BP's resource base.

Dr Daly graduated from the University College of Wales in geology, and completed a Ph.D. at Leeds University. He is also an alumnus of Harvard Business School.

Dr Daly joined BP in 1986, and embarked on a career in the major oil provinces of the Middle East, Venezuela, Russia, Mexico, Alaska and the North Sea, as well as Antarctica, Mongolia and Greenland. Over the past ten years he has held a number of functional and leadership posts in BP's E&P business, most recently spending six years in leading BP's business in the Middle East and South Asia.

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