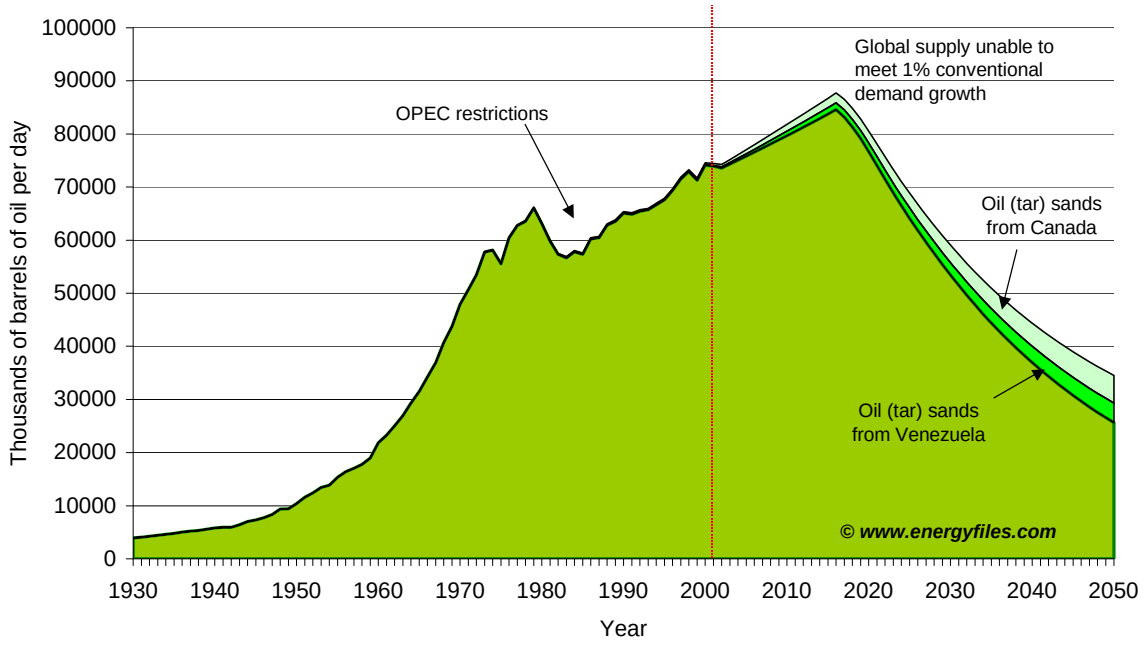
The future for Asia-Pacific oil & gas

Dr Michael R. Smith - EnergyFiles
(e-mail: michaelsmith@energyfiles.com)

Analysis of all global sources of oil shows that the world's known and yet-to-find reserves will not be able to satisfy the 2002 level of production of around 74 million barrels per day beyond 2020. This is a peak year – the last year in which supply can meet demand. Of course any growth in global economic activity will increase demand bringing forward the peak year. For example a 1% demand growth could bring the peak year to around 2016 when production will reach 85 million barrels per day as shown in Figure 1.

FIG 1: World oil production, 1930 to 2050 assuming 1% demand growth



Oil is already fast being replaced by gas in the heat and power industries. The Asia-Pacific region, with surplus gas resources, could be well placed to take advantage of increases in gas markets but, with its rapidly growing transport infrastructure[1], the region has its own dependence on imported oil as well as needing all of its indigenous gas. The region will thus be seriously exposed to global competition for energy. In view of such vulnerability, the medium-term future for Asia-Pacific oil and gas supplies and drilling activity are discussed here.

[1] There is, as yet, no bulk substitute for oil in the transport industry

Oil in the region

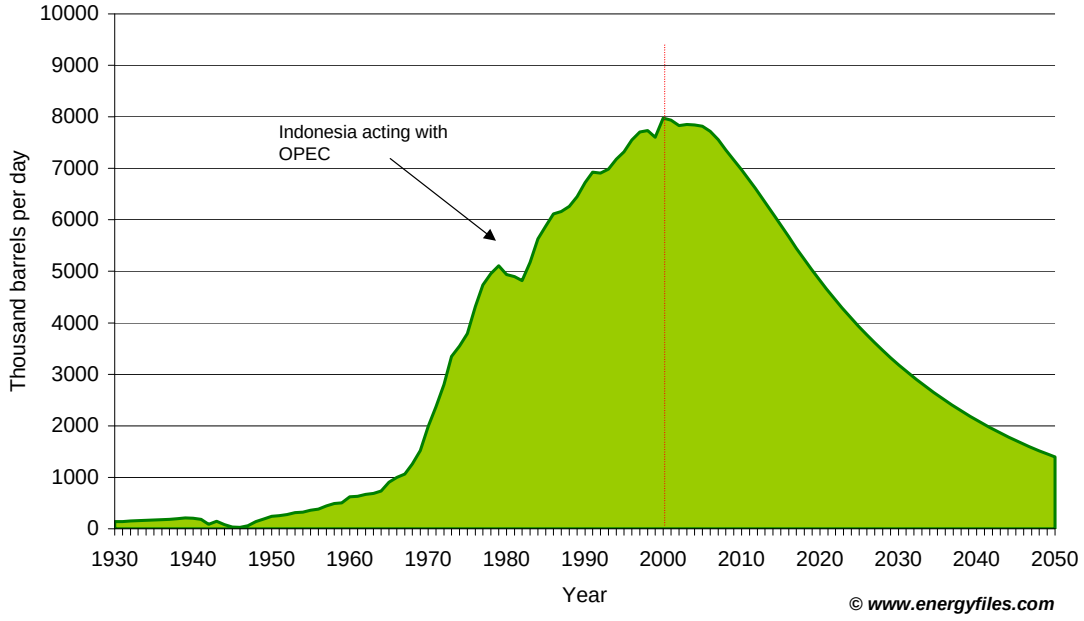
The Asia-Pacific possesses just 7% of the worlds discovered, plus yet-to-find oil reserves. In particular China, for its size, is relatively oil poor. At one time it possessed in the order of 60 billion barrels, or 40% of the total original reserves of the region but this was only around 2.6% of the world's original conventional oil endowment of around 2250 billion barrels. The bulk of the remainder was located in Indonesia, Malaysia, Australia and India. Indonesia has already produced nearly two-thirds of its reserves whilst the others have produced between 40 and 50%. Peak years for the region are shown in Fig. 2.

FIG 2: Peak oil in the Asia-Pacific

WELL PAST PEAK	*NEAR PEAK*	*FAR FROM PEAK*
China Taiwan (1987)	Bangladesh	Australia
Indonesia (1991)	China	Brunei
Japan (1992)	India	Vietnam
Myanmar (1979)	Malaysia	
New Zealand (1997)	Thailand	
Pakistan (1991)		
Papua New Guinea (1993)		
Philippines (1979)		

Of the world's seven regions the Asia-Pacific has, after Europe, the lowest oil production at around 7.8 million barrels per day or 11% of global production - and this in an area with roughly half the world's 6.2 billion population. Yet-to-find reserves are relatively low and peak year may already have passed - perhaps occurring in 2000 at around 8 million barrels per day as shown in Figure 3.

FIG 3: Asia-Pacific oil production, 1930 to 2050



Despite its huge population, each year the region only consumes around 28% of global oil - less than North America. Nevertheless, at 21 million barrels per day, it still has to import nearly 70%. Only Indonesia, Malaysia, Brunei and Vietnam are exporters. Indonesia will soon need to import and all the other countries require large volumes. Japan, followed by South Korea, China and India, lead the importers. If the Asia-Pacific wishes to sustain economic growth it will have severe oil supply problems to contend with once world supplies tighten during the next decade.

Gas in the region

Oil, with its higher energy density, is more convenient to store and distribute than gas. However, global gas markets are developing rapidly with new pipeline routes, spanning continents, planned to develop all the world's major reserves. Gas-to-liquids technologies are also proposed to exploit distant and stranded volumes and most substantial gas fields will soon be commercially viable using one or other of the container–based distribution methods – such as compressed natural gas (CNG), liquefied petroleum gas (LPG), gas-to-gasoline (GTG) and especially liquefied natural gas (LNG) and Fischer-Tropsch gas-to-liquids (FT-GTL).

The international trade in LNG for power generation began in the Asia-Pacific in the 1970's. Indonesia, Malaysia and Australia are major suppliers whilst Japan, Taiwan and South Korea are major users. LNG projects, now proliferating around the world, include plans for floating units (FLNG) to exploit offshore stranded gas reserves. Shell in Australia wishes to pioneer FLNG for the Sunrise development in the Timor Sea but mounting an LNG project remains a complex, time-consuming and costly operation. The lead-times from proposal to project completion are still around 8 years. First gas for Sunrise is currently scheduled for 2009.

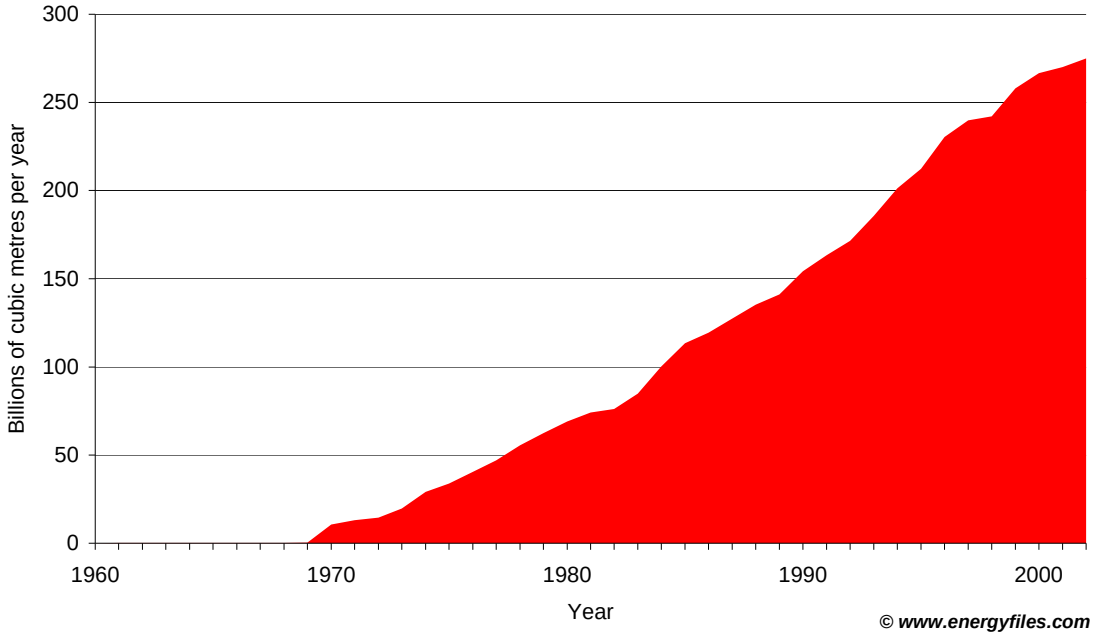
FT-GTL technology, in which the low-emissions diesel produced is marketable in the transport sector, is now the most viable technique for gas to oil substitution. The first commercial natural gas plant[2] went onstream in 1993 in Malaysia whilst the biggest planned project is a Shell-operated 70,000 barrels per day plant in Indonesia. However, due to the complexities, large capital outlays and remote locations, the time from feasibility study to first product maybe over 5 years. By 2005 it is expected that only 7 to 10 will be operating globally producing around 175,000 barrels per day although a substantial proportion of this will be from the Asia-Pacific. Assuming that new projects come onstream at the same rate, global output might reach around 1.5 million barrels per day by 2016. An accelerated program would require substantial new supplies of gas.

The Asia-Pacific region probably possesses the third largest remaining gas reserves of the 7 global regions after the Middle East and the Former

[2] From 1955 South Africa began installing FT-GTL plants using coal gas as a feedstock to overcome the apartheid era oil embargo. South Africa is now a world leader in the process.

Soviet Union - 8% of the world's endowment. It has produced around 20% of this gas and now contributes 275 billion cubic metres per year as shown in Figure 4 - around 12% of global supply. Half this gas is produced by Indonesia, Malaysia and Australia whilst China, India, Pakistan, Thailand, Brunei and Bangladesh are also substantial producers. It is expected, in view of the resource capacity of the region, that another two decades of growth will be followed by a long plateau, as in the US, and then rapid decline[3].

FIG 4: Asia-Pacific gas production, 1960 to 2002



The region consumes roughly as much gas as it supplies with the biggest consumer by far being Japan at around 80 billion cubic metres per year. Other major consumers are Indonesia, China, India, Australia, South Korea, Malaysia, Thailand and Pakistan - all requiring between 20 and 30 billion cubic metres per year. New Asia-Pacific gas reserves are thus needed not only to satisfy growth but also to replace oil in local and global markets. Although there is no current spare capacity it seems likely that there is plenty of undeveloped resource.

Drilling activity in the region

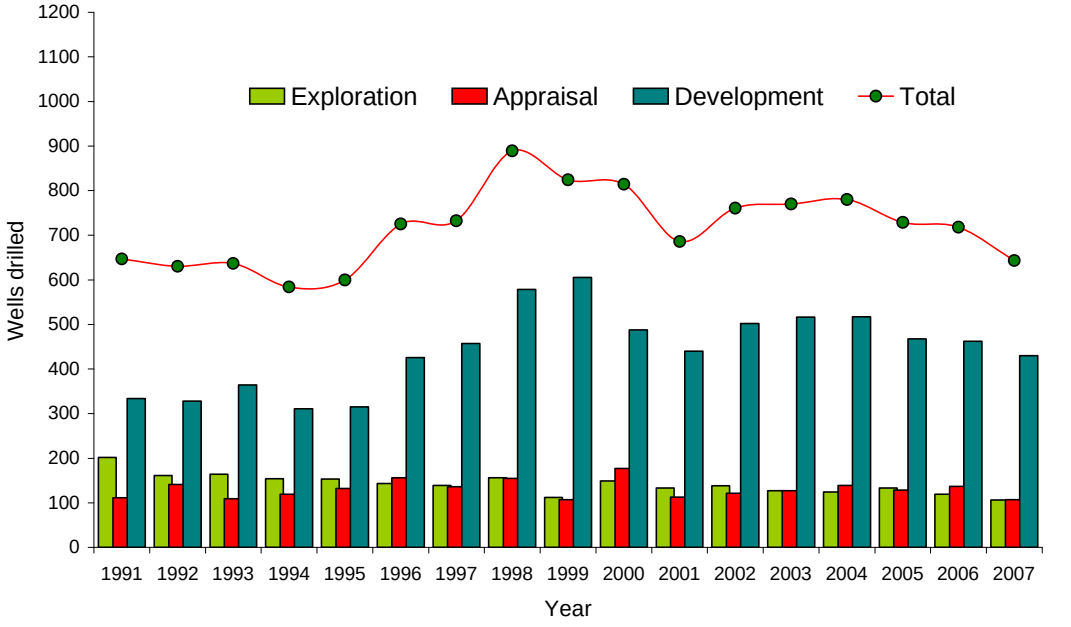
Drilling expenditure in the Asia-Pacific is concentrated offshore with only around 15% spent onshore - the majority in China where the bulk of the region's onshore oil is located. The main areas of offshore drilling are the Indian Ocean west and southeast of India, the Bay of Bengal and the Gulf of Martaban off Bangladesh and Myanmar respectively, the Gulf of Thailand, the South China Sea off Vietnam, Malaysia, Brunei, the Philippines and China, the

[3] Gas production behaves differently to oil. Field output is constrained by infrastructure combined with market conditions. Also the high recovery factors mean that field decline, when it begins, is rapid.

East China Sea and the Bohai Gulf off China, the Java and Natuna Seas and Makassar Strait off Indonesia, the Timor Sea and the Bass Strait off Australia and finally the Tasman Sea off New Zealand.

Asia-Pacific offshore drilling levels increased through the latter part of the 1990's in an environment of increasing energy demand and stable prices linked to improvements in technology. From 1998 to 2002 around 3975 wells were drilled of which approximately 54% were located in Indonesia and Thailand. Australia, China, India, Vietnam, Malaysia and Brunei all made a substantial contribution to the remainder. From 2003 to 2007 increases in drilling activity are forecast in India, China and Vietnam. A stabilisation at high levels is expected in Malaysia and Australia whilst overall declines are expected in Indonesia, Thailand and Brunei. Figure 5 shows the numbers of exploration, appraisal and development wells drilled in the region since 1991, forecast to 2007.

FIG 5: Asia-Pacific drilling, 1991 to 2007



The percentage of development wells relative to other wells has increased since 1991. This increase probably results from diminishing exploration opportunities linked with smaller and less productive field developments that require more wells per unit of production. Over the next 5 years the proportion of development wells is expected to remain stable. Exploration opportunities will continue to decline but large-scale gas and deepwater oil developments, with highly productive wells, will impact on the mix.

Of the approximately US$30 to 35 billion spent globally each year on offshore drilling a little over a quarter is used in the Asia-Pacific, spread across

the region. A similar amount is spent in North America mostly in the Gulf of Mexico. Currently the only growth sector is in deepwater drilling and, because of this, a slight drop in spending in the Asia-Pacific relative to North America (and West Africa) is expected over the next 5 years.

Action plans

There is a contradiction here. The region will soon badly need oil and gas but overall declines in drilling are forecast with only deepwater and remote gas resources seeing increased investment. Since there is no conceivable reason why the international oil industry, beyond the limited ambitions of national oil companies, would put capital into expensive, demanding and high risk deepwater and gas projects, if cheaper, conventional ones could offer the same profitability, there must be a shortage of project opportunities. And this is not because of poor investment terms - there are simply fewer and smaller undiscovered or undeveloped oil and gas fields. Drilling levels are opportunity-constrained with gross expenditures unable to increase even should there be real oil price growth.

In such an environment companies and governments must try to fully understand the problem of dwindling opportunity and determine just where the world's oil and gas will be coming from over the next 20 years, how much of it will be available and who will want it. Viable alternatives, especially for the transport industry also need to be considered. There are heavy oil sands in Canada and Venezuela, gas-to-liquids projects, oil shales, renewables projects, and coal and nuclear power, but these are expensive and time-consuming, some are environmentally questionable and mostly are, as yet, ineffective as oil substitutes in transport, even when used to generate electricity or hydrogen.

In the light of the above there are many actions that could be taken to try to ameliorate an energy shortfall. Countries must continue to promote exploration and development of gas reserves, such as in Pakistan, Bangladesh, Myanmar, Thailand, Malaysia, Indonesia and Australia, regardless of the oil price. However they must also construct agreements that reserve substantial volumes for long-term local use. Countries must continue to encourage replacement of oil with piped gas and LNG for electricity generation and heating using appropriate tax structures. Gas-poor countries, particularly China, Japan and India, will have to negotiate long term gas and LNG supply contracts that span the next decade.

Companies should increase research into gas-to-liquids technology and countries must create fiscal regimes that encourage project set-up where stranded gas reserves proliferate, such as in Australia and Indonesia. There is also a need for supply-driven growth of local renewables projects, especially wind, solar and biomass in the land-rich countries, to encourage replacement of both oil and gas. Re-invigoration of the coal industry in China and Australia could be achieved with development of new methods for processing and cleaning coal and flue gases.

Programs are especially needed for massive improvements in energy efficiency and conservation along with initiatives to promote electrified mass transit systems and automobile fuel replacement strategies, in particular employing distribution systems for CNG and, over the longer term, hydrogen. Whatever happens the cost of air travel is set to rise considerably. Oil, gas and service companies are thus presented with a future of higher prices allied to fewer opportunities. In such an environment only those with a focused technological, geographic and/or commercial strategy can prosper. The days of the traditional scattergun, small and mid-size exploration or geological or engineering service company are over.

For full information on the above please subscribe to www.energyfiles.com and see the following reports,

- *The World Oil Supply Report*
- *The World Offshore Drilling Report*
- *The World Gas Supply Report (in press)*