



# Peak oil, risk and opportunity

By **David Bell, Ian Dunlop** and **Garry Glazebrook**

- *Fears that oil production has peaked but demand will continue to grow and availability will contract*
- *Separate issue from climate change, but will require holistic solution*
- *Not all companies or industries equally exposed; many partial solutions available in immediate, medium and long term*

The success of the global market economy is totally dependent on the availability of cheap energy from fossil fuels. But that availability is about to dry up, firstly due to the need to address climate change and secondly due to peak oil, the issue, which may have even greater impact on our society and economy than climate change in the short term.

It now appears that businesses that have been reliant on oil are beginning to sense that the peaking of oil is a reality in the not too distant future. In a recent speech by Rick Wagoner, the CEO of General Motors he made the following comment.

As the demand for energy around the world is growing faster than supply. And that's not just a cyclical phenomenon, it's structural ... The world will need 70 per cent more energy in the year 2030 than it did in the year 2004.<sup>1</sup>

This for GM is a problem and by recognising it as such, recognises that the concept has become the mainstream. Wagoner also accepted we are now living in a world of US\$100 per barrel oil.

Peak oil takes its name from the bell-shaped curve, which typifies the production profile of any oil field. Once an oilfield is discovered, oil wells

are drilled and production rises until drilling saturation is reached, whereupon production levels off and reaches a peak. Production then begins to decline as reservoir pressure drops, following a 'depletion curve' which makes up the declining segment of the bell shape. This profile may be disrupted by extraneous events such as shutdowns due to technical or geopolitical factors, but broadly it has been shown to apply to oilfields worldwide. The concept was originally developed in the 1950s by M King Hubbert, a senior oil geologist with Shell Oil in the USA. Hence the curve is often known as the 'Hubbert curve'.

It applies to an individual oil field, but also, when production profiles are cumulated, to all oil fields in a region, a nation, and to the globe. It has been used to accurately predict the peaking of oil production in a number of regions around the world; the concern now is with the peaking of overall global oil supply.

The shape of the curve and height of the peak depend on various oil reservoir characteristics, but also, critically, on the estimated total amount of oil that will be recovered — the URR (ultimately recoverable resource). The peak is reached when approximately half of the URR has been produced. Thus if the global URR increases due to improved technology, greater exploration success or the availability of oil from, unconventional sources such as tar sands, oil shales or very deep water exploration, the peak is pushed out in time.

One of the main criticisms of the Hubbert curve has been that the URR is essentially indeterminate given the large resource base available from unconventional resources. For example, there is no dispute that global oil production to date, since oil reserves were discovered in the 1850s, is around one trillion barrels. There is, however, great dispute over what remains to be discovered, and hence the global URR.

The 'official view', from organisations such as the International Energy Agency (IEA) and the US Geological Survey (USGS), until recently, was that

we had abundant resources available from both conventional and unconventional sources which would meet rapidly expanding global demand as China and subsequently India became large consumers. The URR was estimated to be in the three to five trillion barrels range, suggesting we were 15 to 40 years away from the peak, and thus there was no cause for concern.

### Are we at the peak?

It is one thing to have oil resources in the ground; it is quite another to convert those resources into oil flows to the market. Many economists took comfort as the oil price rose toward US\$100 per barrel, on the grounds that supply will always balance demand and the higher prices would stimulate additional production.

But it now seems that there are unexpected problems in increasing the oil flows, from both conventional and unconventional sources, to meet expanding market demand and to offset the decline of established oilfields, such that the URR may be considerably below previous 'official' estimates, possibly around two trillion barrels.<sup>2</sup> If that is so, we are close to the peak, or possibly already past it. As oil production has plateaued since 2004, the crude oil price has escalated dramatically, reflecting burgeoning demand from China in particular.

### Reasons for lack of growth in oil production

The reasons for the plateau are at least fivefold.

First, despite continually improving technology, we are not discovering new oilfields fast enough, and certainly no giant fields. The majority of the giants were discovered in the 1950s and 1960s, since which discovery rates, and the size of discoveries, have dropped substantially while production has risen, opening up a widening gap.

Second, data on existing oil reserves is suspect, particularly in the Middle East, which holds the bulk of the world's remaining conventional oil. In some countries, it is believed that reserve estimates were artificially inflated in the 1980s to maximise production under the OPEC quota arrangements in place at that time — the so-called 'paper barrels'! Thus there may be considerably less conventional oil than previously anticipated. Some experts put the overstatements of reserves at around 300 billion barrels. This equates to nearly 30 years of OPEC production.

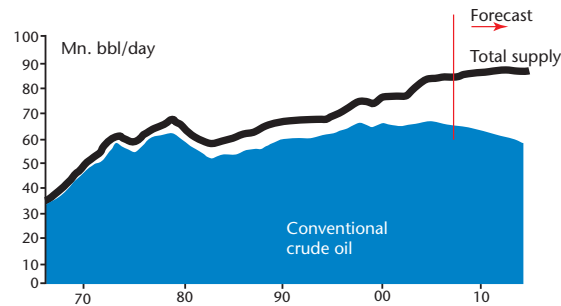
Third, many established oil provinces have already passed their peak and are in decline. It is suspected that their depletion rates are often more rapid than officially admitted.

Fourth, the development of unconventional resources is proving to be more difficult than previously envisaged, both technically and economically.

Fifth, as oil producing nations get richer they use more of their own oil and export less.

This has generated an increasing note of caution. Recent reports from the IEA<sup>3</sup> and the US National Petroleum Council<sup>4</sup> are the first, grudging, official admissions that peak oil may soon become a reality.

**Figure 1: Global conventional oil production has not grown since 2004**

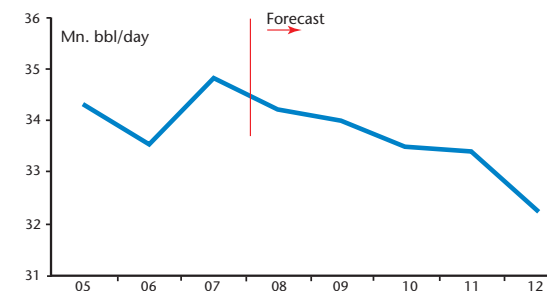


Source: CIBC

A further indication of current thinking is contained in a recent assessment by the Canadian Imperial Banking Corporation (CIBC)<sup>5</sup>, highlighting the possibility that global oil production including condensate and gas liquids will peak in the next few years at levels close to current production. See Figure 1.

As mentioned, an increasing proportion of available oil will be used within OPEC, Russia and other major oil producers, implying falling availability for OECD countries as a result of reduced exports.

**Figure 2: Exports: OPEC, Russia and Mexico (2005–2012)**



Source: CIBC

OPEC, Mexican and Russian consumption will rise from nearly 13 million barrels a day to over 16 million barrels a day by 2012. This will take nearly all new production increases from these areas over the next half decade. This means the oil market will be very tight, the flow-on being continued inflation and a stagnating economy, the signs of which may be already evident in the USA.

### A five-year scenario

CIBC considers that future growth in oil consumption will be particularly strong in oil-producing and newly developing countries. Production will probably increase slightly, but soaring demand will ensure prices will rise over the coming five years. The OECD countries will moderate their demand, in part due to economies not taking high oil prices in their stride. This emphasises the need for energy efficiency and conservation throughout the OECD, Australia included. Crude oil prices around US\$150 may be in prospect by 2012.

### The macro implications

At the peak, oil does not run out immediately, as we still have half of the URR to produce. However, it is the point at which further expansion of oil production becomes impossible because new production is fully offset by the decline of existing production, irrespective of the oil price. It may take the form of a sharp peak, if for example some of the giant fields start to decline rapidly, or it may be an undulating plateau spread over a number of years if, for example, oil demand is destroyed as a result of recession or developing countries no longer being able to afford high oil prices. The former is in prospect, the latter seems to be happening already.

Given the absolute dependency of modern societies on oil and gas, an inability to expand supply to meet increasing demand will be traumatic. Australia is particularly vulnerable, as highlighted by the 2006 Senate Committee inquiry<sup>6</sup>, but the issue is barely on our political agenda. While still 50 per cent self-sufficient in oil, albeit steadily declining, our imports are currently 85 per cent of daily usage, offset by high exports. Australia, in contravention to its

obligations as a member, is the only IEA country not to maintain a 90-day net imports strategic petroleum reserve. It is also heavily dependent upon transport fuels<sup>7</sup>, for which there are currently few alternatives to oil.

Some obvious solutions to peak oil, for example increased coal consumption or coal conversion to liquids, are carbon intensive and thus would be extremely detrimental to solving the pressing problem of climate change. Other solutions, if they involve overall reduction in fossil fuel consumption, would assist in addressing climate change. The two issues are inextricably linked and need to be treated with consistent and holistic policy to meet both climate change and peak oil objectives.

If oil does move into short supply, it raises the question of who gets the oil that is available. Possible solutions include the following.

- Letting the market take its course — free market economists argue that supply will always balance demand at some price, but conveniently skirt around the traumatic societal impact of recession or depression arising from the implied higher energy prices, and the potential for failed states as the developing countries are increasingly forced out of the market
- The 'Washington Consensus' of military intervention to secure supply — recent experience suggests this is hardly a sustainable alternative
- A global oil depletion protocol to provide for orderly, equitable sharing of available oil, akin to the Kyoto Protocol for carbon — the IEA might be charged with its administration, a similar if enlarged role to that for which it was created in the 1970s.

**Table 1: Higher oil prices needed to ration fast-rising global demand\***

Million barrels per day	2007	2008	2009	2010	2011	2012
World oil demand	85.7	86.1	87.0	87.9	88.4	88.4
– change	1.2%	0.5%	1.0%	1.1%	0.6%	0.0%
OECD (excluding Mexico)	47.2	46.4	46.0	45.6	44.8	43.6
– change	– 0.3%	– 1.6%	– 0.9%	– 0.9%	– 1.7%	– 2.6%
OPEC, Mexico, Russia	12.8	13.4	14.1	14.8	15.6	16.4
– change	4.9%	5.0%	5.0%	5.1%	5.1%	5.1%
China, other developing countries	25.8	26.3	26.9	27.5	28.0	28.4
– change	2.3%	2.0%	2.3%	2.4%	1.9%	1.4%
World oil supply	85.3	86.1	87.0	87.9	88.4	88.4
West Texas Crude (US\$ per barrel)	72	95	105	115	130	150

Source: CIBC

\* Projected volumes and prices for 2008 and beyond

Clearly there are major uncertainties associated with the emergence of the global oil peak, but the exact date of the peak is less relevant than acceptance of the principle. The changes the peak implies will fundamentally alter society and business as we know them.

The dilemma we face was put succinctly by the IEA's Chief Economist shortly after the release of the IEA 2007 World Energy Outlook last November:

There are two major messages [from the Outlook]. The first one is [that] the energy security risks are so strong, and probably increasing, for an upward event in the markets and the second is on climate change. CO2 emissions are reaching a certain level that we are [getting into] an irreversible trend for our planet. ... If we don't do anything very quickly, and in a bold manner, our energy system's wheels may fall off.<sup>8</sup>

### The micro implications

Given the pervasive use of oil, virtually all industries will be affected to some extent, particularly in the transport arena. As oil increasingly becomes a premium product, business models, governance and corporate responsibility will have to be fundamentally reassessed. Solutions are available, but there is no 'silver bullet', rather we have much 'silver buckshot' to address the problem.

- Energy efficiency and resource conservation should become paramount, using both regulatory and market mechanisms
- Perverse incentives and taxes encouraging oil consumption and inefficient energy use should be removed
- High quality, efficient public transport, cycling and walking should be encouraged, integrated with urban planning
- World best practice vehicle emission standards should be mandated, with much of the Australian car industry converted to hybrid and electric car manufacture
- High-speed broadband access will become essential to reduce travel and energy burden by sending electronic information rather than people travelling or sending documents and goods where possible over long distances. These are all examples of what is defined as dematerialisation
- Urban design must be rethought, particularly suburban developments on the outskirts of the cities with no reliable public transport
- A halt should be called to further expansion of freeways to constrain expanding vehicle use, with congestion taxing on vehicles in capital cities
- Airlines and international sea-freight bunkers should be included in emissions trading, with cheap air travel curtailed

- Supply chains should shorten and local production expand
- Taxation systems must be reformed to focus on taxing 'bads' rather than 'goods', with an emphasis on the preservation of the global commons

Australia will be particularly affected by oil shortages because of the long distances from overseas markets. For example, as aviation becomes more expensive, international tourism and business flights could be significantly affected, with other sectors like exports of perishable cargoes also being hit, in turn flowing on to agricultural production.

Such solutions will take time to implement, typically at least a decade. Given the potentially severe impact on Australia, prudent risk management suggests we should be planning for these changes today, before the peak arrives. We have already left it very late.

### What should a company do?

#### First — identify your risk exposure

At the company level, the first step in responding to the challenge of peak oil is to identify your risk exposure to a potential physical shortage of oil and the potential escalation in oil prices.

Corporate oil vulnerability analysis to address these issues will become standard risk management practice. This will encompass:

- a thorough understanding of the use of oil products throughout your operations. Often, the pervasive importance of oil is not well understood
- similar analysis for suppliers and customers, to understand potential implications for supply chains
- sensitivity and resilience assessment to understand the potential range of impacts that may lie ahead. Resilience is particularly important. Companies without the ability to adapt to potentially rapid changes brought about by climate change and peak oil are at risk. By contrast, companies who anticipate potential scenarios and are ready to respond will be advantageously placed
- reviewing corporate strategy, both long and short term, in the light of this analysis, to understand your strong and weak points.

#### Second — mitigate the risk

Once an appreciation of the possible impact of peak oil on your organisation and corporate strategy has been established, the second step is to mitigate the risks. Typical steps that might be taken are as follows.

In the short term:

- get staff thinking about the implications of climate change and peak oil, with awareness programs, strategy review

- encourage innovative thinking on solutions
- look for the 'low hanging fruit' that enable you to reduce energy and particularly oil consumption rapidly and inexpensively. Often this can be done today with economic benefit, and has previously been overlooked
- continually monitor these risks from the viewpoint of customers, suppliers, the community, your business and staff and be prepared to react accordingly if risks intensify.

In the medium term:

- ensure all business plans do not continue with 'business-as-usual' as their starting point
- take action such as buy more fuel-efficient vehicles
- look at the use of more video conferencing, telephone and internet meetings rather than travelling by car and plane
- encourage staff to take more public transport and be located around high quality public transport
- work with suppliers and key customers and clients to reduce vulnerability
- explore the feasibility of increasing the proportion of rail freight and reducing supply chain length
- institute a program of energy conservation and measure your results
- speak with other business leaders and elected representatives to get the right investment decisions that aid longer term sustainability
- keep abreast of energy and climate change issues
- develop sustainable products, less energy and waste intensive, full life-cycle design.

In the long term:

- consider whether your business sustainable in the absence of cheap energy
- consider whether you need to relocate your business closer to public transport or intermodal hubs
- consider whether you need to develop new supply and distribution chains
- localise production
- cut reliance on oil and other fossil fuels, replacing them with sustainable alternatives.

### Third — adapt and look for opportunities

Change of this magnitude can engender paralysis, denial and defence of the 'status quo', to the point

of irrationality despite mounting evidence to the contrary. This has happened with our response to climate change over the last decade. We are only now realising that we must move far faster, and in far less advantageous circumstances, than would

have been the case had we taken action a decade ago.

We should not allow the same to happen with peak oil. It is clear that the days of cheap energy, and cheap oil in particular, are over. We need to rapidly put in place strategies that recognise and accept that reality, but, most importantly, do so not in a reactive, defensive mode, but proactively look for solutions and the opportunities which are undoubtedly waiting.

The first step in responding to the challenge of peak oil is to identify your risk exposure to a potential physical shortage of oil and the potential escalation in oil prices.

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### Notes

- 1 See <http://www.energybulletin.net/39096.html> [5 March 2008]
- 2 Association for the Study of Peak Oil, <http://www.aspo-australia.org.au> [28 February 2008]
- 3 'Medium Term Market Report', International Energy Agency, Paris, July 2007, 'World Energy Outlook', International Energy Agency, Paris, November 2007
- 4 *Facing the Hard Truths about Energy* US National Petroleum Council Global Oil & Gas Study, 18 July 2007
- 5 J Rubin and P Buchanan, 'Delays will Tighten Global Oil Markets' CIBC World Markets Occasional Report #65 January 2008
- 6 Australia's future oil supply and alternative transport fuels, Senate Committee on Rural and Regional Affairs and Transport, February 2007
- 7 B Robinson and S Mayo (2006) *Peak Oil and Australia: Probable impacts and possible options*, ASPO Australia
- 8 E Crooks and J Blas, Interview with Fatih Birol, Chief Economist, IEA, *Financial Times*, 7 November 2007 ●