Submission to the Select Committee of the Legislative Council on the Impact of Peak Oil in South Australia.
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"And therefore, to the peakists I say you can declare victory. You are no longer the beleaguered small minority of voices crying in the wilderness. You are now mainstream. You must learn to take yes for an answer and be gracious in victory."

Dr James R. Schlesinger, former Director of Central Intelligence (CIA, 1973), former Secretary of Defence (1973-75) and the first Secretary of Energy (1977-79) speaking at the ASPO-6 Conference in Cork, Ireland, 16-17 September 2007.

This will be a brief submission. If the Select Committee would like to follow up on any of the information below then I will do my best to make an additional written or oral presentation when they wish.

There is little doubt that the peak rate of world oil production has either been passed or soon will be. A variety of different methods for predicting peak oil production (analysis of oil reserves, Hubbert linearization analysis, analysis of current depletion rates versus new projects projected to come on line [aka "Megaprojects" analysis] and computer modelling of the world's oil production) all point to the peak rate of oil production occurring before 2015. I have previously addressed this in a number of publications directed at the general public (see list of publications at the end of the submission).

That we may never greatly exceed today's oil production rate (i.e. peak oil is now) seems very likely since Russian oil production now appears to be in decline and Saudi Arabia wishes to conserve its oil for future generations. See:

www.energybulletin.net/43048.html

and

www.peakoil.net/headline-news/russia-has-peaked-according-to-lukoil

In the light of this we must also remember that oil available on the world export market is likely to decline far more rapidly than world oil production. By 2020 Australia may have access to only a minor fraction of the oil that it currently uses and this at a far higher price than today:

www.onlineopinion.com.au/view.asp?article=6584

In the short time, if any, remaining to us before a major oil price/supply crisis hits Adelaide I would ask the committee to consider what it means for our community to be resilient in the face of this stress and what we should, and should not do, in order to increase this resilience.

To understand the resilience of a community or population faced with change in resource availability we need to understand Liebig's Law of the Minimum – that growth is controlled not by the total of resources available, but by the scarcest resource. This means that a **community can only be resilient when supplies of the resources and services required for its functioning/survival are at levels <u>well above</u> the minimum needed.** This ensures the existence of a buffer of reserve capacity upon which the community can fall back.

In the coming energy crisis energy efficiency will be promoted as one of the best ways to cope. However, it is essential to note the following:

1) Energy efficiency is subject to diminishing returns – i.e. each step gain in efficiency is more difficult/expensive than the last to accomplish. It is impossible to become "completely efficient".

2) If efficiency gains are used to allow continued population growth then **this reduces reserve capacity and resilience**! In other words, population growth on the back of efficiency leads inevitably to collapse.

At the moment Adelaide's growing population is maintained by transport and food provision services that are virtually totally dependent on oil. We already see how our limited water supplies are calling into question the long term sustainability of the current population. (The proposed solution – a desalination plant at Port Stanvac – will require additional energy generation over and above the large amounts that are already required for pumping and purification of water in South Australia.) We urgently need to know what Adelaide's sustainable population will be at oil/energy availability levels much lower than those existing today. This question needs to be answered using a scientific approach that considers current and future resource availability. Economic approaches based on fantasies about the possibility of infinite growth in a finite system or about the possibility of substitution of resources that are, in fact, non-substitutable have nothing to contribute to this discussion.

The question of the sustainable population level for South Australia must not be ignored because we find it embarrassingly contentious or difficult to assess. We certainly do not want to find out the sustainable population level the hard way – by exceeding it! **We need to estimate the population limit that South Australia can maintain at the much lower levels of available oil that will prevail in the future – we then need to aim for a population size that is well within this sustainable limit. Only then we will have a community that is truly resilient and can cope with future challenges such as climate change (and other stresses as yet unknown and unexpected).** As a community the future of all our children will be dependent upon us abandoning the ultimately fatal fantasy of growthism. We are all part of this and nobody's children will escape the consequences.

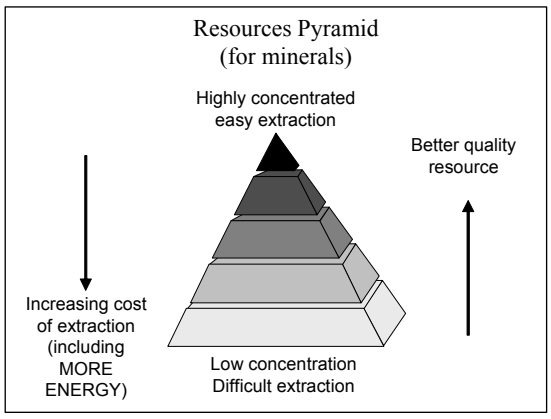
I would also like to direct the committee's attention to three additional things:

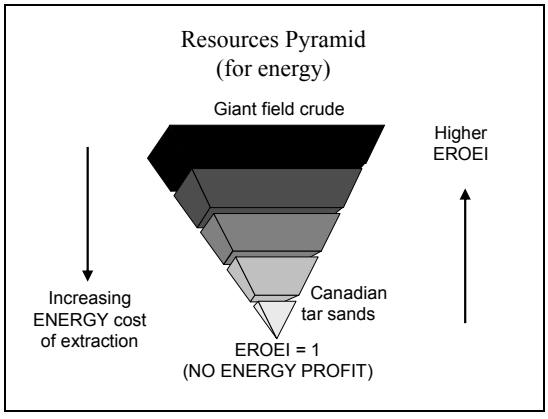
1) Bentley, Mannan and Wheeler have published an outstanding analysis of the reasons behind the confusion over the real size of the world's oil reserves ("Assessing the date of the global oil peak: The need to use 2P reserves" – Energy Policy 35 [2007] 6364–6382). They show very convincingly that the idea that oil reserves are continuing to grow is the result of a simple statistical error. This simple error has had surprising ramifications in terms of the development of the economic theory surrounding oil reserves. I strongly urge the committee to read this paper and I have included a copy with this submission.

2) The idea of the "resource pyramid" is often used to support the idea that there are few real limits on the global reserves of hydrocarbons. The resource pyramid idea states that, as the most concentrated, (low extraction cost) source of a raw material (e.g. copper, iron, uranium) is used up (i.e. mined out) then the consequent shortage of supply leads to an increase in price which makes the extraction of the material from lower quality ores economically viable. Since the total volume of the material in the lower grade ore is greater than in the higher grade ore, then the higher price of the resource effectively greatly expands the total amount of the resource that is available. (i.e. as one moves down in resource quality, the resource base expands, hence the idea of the "pyramid".) **What is not widely understood about the resource pyramid idea is that it is based on an assumption that the energy cost of extraction of the resource is insignificant.** This means that:

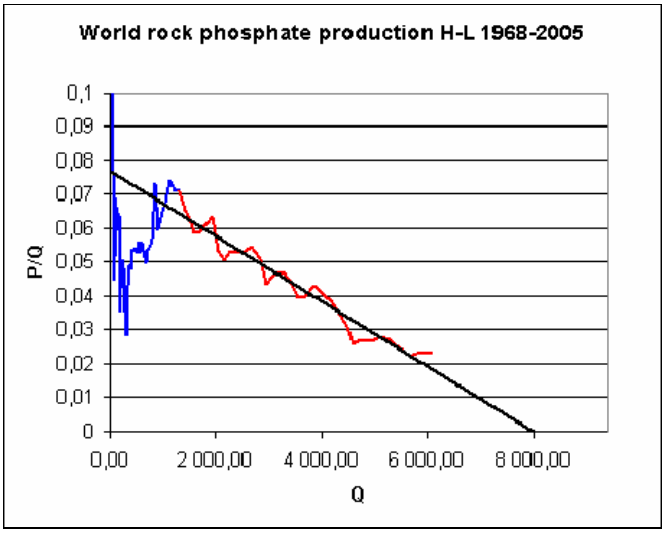
a) As the price of energy rises, the availability of other mined resources will decline (i.e. consider the sensitivity of the expansion of the Olympic Dam mine to rising fuel prices) and

b) That when the resource being mined is itself being used as a source of energy (e.g. oil) then the relationship of the energy invested in extraction to the energy subsequently produced from the resource becomes vital. This "Energy Returned on Energy Invested - EROEI" is highest when the resource is most easily extracted and decreases as lower grade resources are mined. Thus, **the resource pyramid concept does not apply to resources used for energy production** since lower grade resources yield less net energy than the higher grade resources. Indeed net energy extraction ends when the quality of the resource declines such that the energy produced from the resource equals the energy invested in the production (i.e. EROEI = 1). For this reason, while it is true that humans have only used a minor fraction of the world's total hydrocarbon reserves (as often cited by international oil firms that seek to allay fears of peak oil) most of this resource is useless for energy production since mining it would not give an energy profit.





3) Oil is central to the production of crops by modern "industrial"-scale methods and for food processing and distribution. Therefore decreasing oil availability will require agriculture to become more "local". Growing food in and near cities will allow more human participation as a workforce in agricultural production (replacing oil driven machinery) and will shorten distribution lines. However, the localisation of agriculture is vital for an additional reason – **world reserves of high-grade phosphate are rapidly running out**. Modern industrial agriculture cannot survive without phosphate fertilizer inputs, especially in Australia where are soils are famously poor in phosphate.



(A "Hubbert linearization analysis" showing that we have mined approximately 75% of all the phosphate rock that will ever be mined! Little wonder then that prices of phosphate fertilizer are currently at record levels. To read the paper from which this analysis was taken see www.energybulletin.net/33164.html. Note that P/Q is the ratio of annual production over total production to that date. The maximum amount of phosphate rock that will be mined is predicted to be 8,000 million tonnes.)

The ONLY solution to this problem is to recycle our wastes back to the soil producing the food in order to recapture the phosphate.

<u>Recommendation</u>: In light of the above, the most fundamental and important recommendation that the Select Committee can make to enable South Australia to cope with higher fuel prices and the other resources challenges of our future is to encourage the growing of food within and immediately surrounding settlements (e.g. Adelaide). There is no more energy efficient and water efficient way to grow food than when it is grown by gardeners for their own and nearby community's use (using e.g. drip irrigation techniques). The SA government should ensure that priority is given to provision of energy and water resources required for this local food production above all else.

Articles, radio presentations and major letters by Michael Lardelli on oil depletion:

Does an Approaching Peak of Oil and Gas Production Presage a National Emergency?
(Viewpoint, 30 April 2004)
www.the-funneled-web.com

Decline in World Oil and Gas Production
(ABC Radio National Perspective16 August 2004)
http://www.abc.net.au/rn/talks/perspective/stories/s1178256.htm

As The Well Runs Dry
(Article in The Adelaide Review, 12 November 2004)
http://tinyurl.com/5yg9o

The Devil's Handmaiden To Global Warming
(Op-Ed, 31 March 2005)
www.the-funneled-web.com

Thinking Ahead Of The Curve On Oil Depletion – The View From Hubbert's Peak
(ABC Radio National Perspective 2 May 2005)
http://www.abc.net.au/rn/talks/perspective/stories/s1358063.htm

Oil Crisis Is Only Going To Get Worse
(Article in The Adelaide Review, 30 September 2005)
http://tinyurl.com/8gcm4

Drastic Action For A Post-Oil Age
(Article in The Adelaide Review, 14 October 2005)
http://tinyurl.com/c7rv4

Energy Efficiency – Saviour or Suicide?
(Letter to Green magazine, Issue 21 Summer 2006)
http://dev.greens.org.au/library/action/magazine/green21.pdf

Scientists Need to Confront Economists About Peak Oil
(Correspondence in Nature 15 March 2007)

Peak Oil is now?
(ABC Radio National Perspective 30 March 2007)
http://www.abc.net.au/rn/perspective/stories/2007/1881872.htm

Economic Growth to End Soon – Forever
(Article in Online Opinion, 3 May 2007)
http://www.onlineopinion.com.au/view.asp?article=5798

A Revolutionary Report on the Future of Oil
(Article in Online Opinion, 30 July 2007)
http://www.onlineopinion.com.au/view.asp?article=6168

Peak Oil Issue Not Going Away
(Article in The Adelaide Review, 17 August 2007)
http://tinyurl.com/2nl7j6
See expanded version published as:
Our finite planet: planning for a decline in our oil bounty
(Article in Online Opinion, 20 August 2007)
http://www.onlineopinion.com.au/view.asp?article=6227

Sleepwalking over the oil peak
(Article in Online Opinion, 5 November 2007)
http://www.onlineopinion.com.au/view.asp?article=6584

To save the world we may have to waste it
(Article in Online Opinion, 15 February 2008)
http://www.onlineopinion.com.au/view.asp?article=6998

The 2020 Summit – more hallucination than clear vision
(ABC Radio National Perspective, 11 March 2008
and Online Opinion article, 17 March 2008)
http://www.abc.net.au/rn/perspective/stories/2008/2186644.htm
http://www.onlineopinion.com.au/view.asp?article=7128

Whither Peak Oil at Rudd's 2020 Summit?
(Online Opinion Article, 10 April 2008)
http://www.onlineopinion.com.au/view.asp?article=7213

The 2020 Summit- Will Rudd's children forgive him?
(Online Opinion Article, 23 April 2008)
http://www.onlineopinion.com.au/view.asp?article=7281

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Assessing the date of the global oil peak: The need to use 2P reserves

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Abstract

Combining geological knowledge with proved plus probable ('2P') oil discovery data indicates that over 60 countries are now past their resource-limited peak of conventional oil production. The data show that the global peak of conventional oil production is close.

Many analysts who rely only on proved ('1P') oil reserves data draw a very different conclusion. But proved oil reserves contain no information about the true size of discoveries, being variously under-reported, over-reported and not reported. Reliance on 1P data has led to a number of misconceptions, including the notion that past oil forecasts were incorrect, that oil reserves grow very significantly due to technology gain, and that the global supply of oil is ensured provided sufficient investment is forthcoming to 'turn resources into reserves'. These misconceptions have been widely held, including within academia, governments, some oil companies, and organisations such as the IEA.

In addition to conventional oil, the world contains large quantities of non-conventional oil. Most current detailed models show that past the conventional oil peak the non-conventional oils are unlikely to come on-stream fast enough to offset conventional's decline. To determine the extent of future oil supply constraints calculations are required to determine fundamental *rate limits* for the production of non-conventional oils, as well as oil from gas, coal and biomass, and of oil substitution. Such assessments will need to examine technological readiness and lead-times, as well as rate constraints on investment, pollution, and net-energy return.

Keywords: Oil supply; Proved reserves; Probable reserves

1. Introduction

This paper sets out to counter the view expressed in a recent article in this journal: *Oil scarcity*: *What have the past three decades revealed*? (Watkins, 2006). It does this by setting out the two very different datasets generally used to examine the global depletion of conventional oil.[1] If one uses the proved plus probable (also called '2P') data held in industry datasets for measuring oil discovery, then these indicate that the *resource-limited* peak in the global production of conventional oil is imminent. But if *proved reserves* ('1P') data are used a very different picture emerges, one that supports a cohesive economic view ruling out any near-term threat to global oil supply. It is 1P data that were used in Watkins' paper.

Other topics covered below include a common 'economic view' of depletion, the extent of reserves growth, the correctness of past oil forecasts, factors affecting the date of the conventional oil peak, and the expected date of the conventional gas peak. The paper concludes by listing some of the problems raised by conventional oil and gas depletion that call for deeper analysis.

The discussion starts by examining the two very different oil reserves datasets.

2. Industry 2P oil discovery data

Industry data on the amount of oil discovered in individual fields are held by national and private oil companies; by data companies such as IHS Energy

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[1]Conventional oil here includes all flowing oil from primary and secondary extraction, plus NGLs. Also included is oil from current or planned tertiary extraction. Excluded are very heavy oils (e.g., Orinoco), and oil from tar sand, shale, coal, gas, or biomass.

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