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Letter to Garnaut: Implications of Oil Production Decline

Posted by Phil Hart on September 30, 2008 - 7:00pm in The Oil Drum: Australia/New Zealand
Topic: Policy/Politics
Tags: climate change, garnaut, original [list all tags]

This is an open letter from Stuart McCarthy of ASPO Australia in Brisbane to Professor Ross Garnaut, who is conducting a public review "to examine the impacts, challenges and opportunities of climate change for Australia".

Dear Professor Garnaut,

Implications of Oil Production Decline Forecasts for Copenhagen 2009

Thank you for providing the opportunity for comment on the Review following the release of your Targets and Trajectories Supplementary Draft Report. ASPO-Australia has followed the Review with interest as oil depletion is very much the 'other side of the coin' regarding anthropogenic climate change.

We are deeply concerned that your Draft Report explicitly rejects the notion that oil depletion will constrain economic growth within the next 50 years despite very strong evidence to the contrary. In our view the resulting analysis, conclusions and policy recommendations are flawed and will probably exacerbate the climate change mitigation problem.

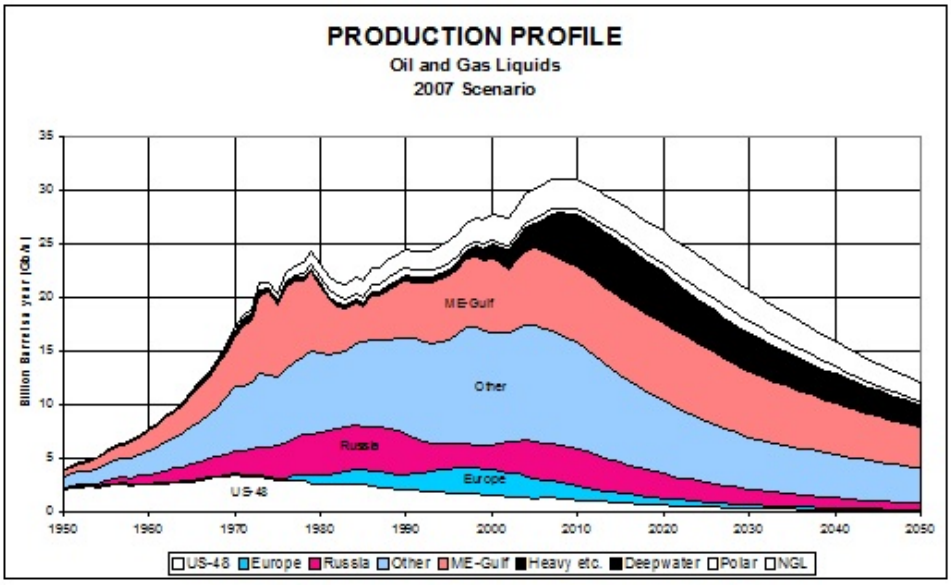

Figure 1. Colin Campbell/ASPO World Production Profile, Oil and Gas Liquids, 2007 Scenario

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The purpose of this letter is to draw your attention to growing acceptance of oil depletion in the scientific community and even by the IEA in its revision of the energy forecasts and emissions scenarios in the forthcoming World Energy Outlook 2008, a document intended in large part to inform negotiations in Copenhagen. Our view is that this will substantially improve the prospects

for an effective agreement around a target atmospheric CO2 concentration of 450ppm.

The IEA and other agencies such as the US Energy Information Administration and Australia's ABARE have traditionally produced demand based forecasts of oil production and simply assumed that reserves and production capacity would meet demand. Typically these have forecast world oil production continuing to increase until at least the 2030 timeframe at rates of up to 120 million barrels per day, compared with the current 87 million barrels per day. Notably, there is already a gap of 1.5 million barrels per day between the WEO 2006 forecast and actual production, i.e. production growth has fallen 50 per cent short of forecast growth over the last two years. Price forecasts based on these production forecasts have been similarly discredited in recent years, even over the short term.

By contrast, a number of recent and ongoing resource based and project based studies of world oil production have concluded that production is likely to peak in the 2007-2018 timeframe, at rates in the range of around 87-95 million barrels per day, before declining at around two to three per cent per annum or more steeply. These include:

- The Colin Campbell/ASPO Oil and Gas Depletion Model (see Figure 1).
- Werner Zittel and Jörg Schindler, Crude Oil: The Supply Outlook, Energy Watch Group, October 2007.
- Kjell Aleklett, Peak Oil and the Evolving Strategies of Oil Importing and Exporting Countries: Facing the Hard Truth About an Import Decline for the OECD Countries, OECD Joint Transport Research Centre, December 2007.
- Fredrik Robelius, Giant Oil Fields - The Highway to Oil: Giant Oil Fields and their Importance for Future Oil Production, Uppsala University, September 2007.
- Chris Skrebowski, Megaprojects Update: Just How Close to Peak Oil are We?, presentation to the ASPO-USA 2007 World Oil Conference, 18 October 2007.
- The collaborative, open-source Wikipedia Oil Megaprojects Database (see figures 2 and 3).

The project based studies are particularly important as the peak in world oil production makes its transition from theoretical projection to observed phenomenon. Even with observed data from the IEA and EIA showing that world oil production has been essentially flat since 2005, sceptics of the proposition of a near-term oil production peak have tended to resort to a faith-based argument that increasing oil prices would ensure increasing discoveries and production. These have simply failed to materialise despite world oil prices having increased by 30 per cent per annum for the last seven years.

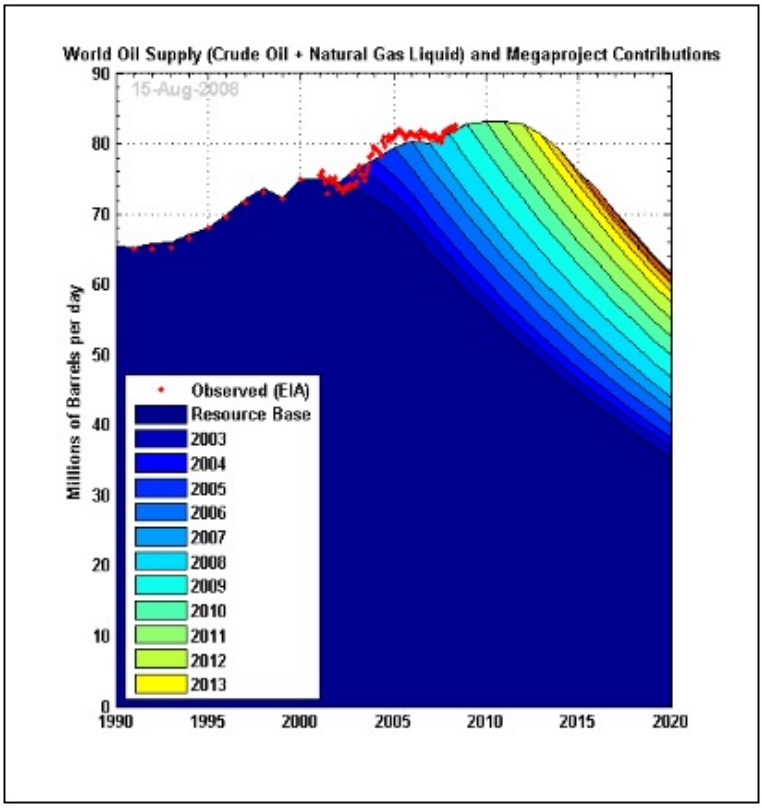

Figure 2. Wikipedia Oil Megaprojects Database, Moderate Decline Rate (4.5% per annum) Scenario, world oil supply and megaproject contributions, compared to observed EIA production data

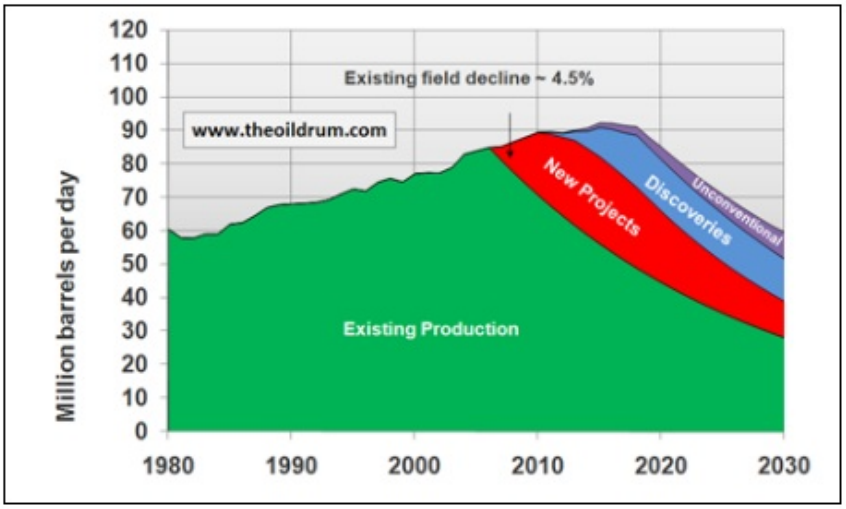

Figure 3. Wikipedia Oil Megaprojects Database, Moderate Decline Rate (4.5% per annum) Scenario, including new discoveries and unconventional oil

Given the five to seven year start-up time for a typical major oil project, and reasonable estimates of depletion rates in existing oil fields, the project based studies provide a good indication of actual production capacities during the period to about 2018, beyond which time underlying depletion in the ageing supergiant oil fields will be the main determinant in overall production rates. Furthermore, while new oil discoveries continue to be made, the inexorable downwards trend in conventional crude oil discoveries has continued since the annual volumes discovered reached a maximum and started declining four decades ago (see Figure 4). There is little or no evidence that world oil production can continue to grow beyond the next decade, indeed the evidence strongly indicates the opposite – a high probability that world oil production will be declining within several years.

Of particular concern to oil importing countries such as Australia (see Figure 5) and most of the OECD is declining world exports. A recent study by oil industry analysts Jeffrey Brown and Samuel Foucher produced a 'middle case' scenario in which exports from the world's top five oil exporters decline by 6.2% per year from the present rate of approximately 24 million barrels per day to approximately 12.5 million barrels per day by 2015,7 i.e. a decline equivalent to one quarter of the world's internationally traded oil over the next seven years. This analysis is reinforced by Jeff Rubin from Canadian Imperial Bank of Commerce (CIBC) World Markets, who recently assessed that world exports will decline by 2.5 million barrels per day over the next three years.8

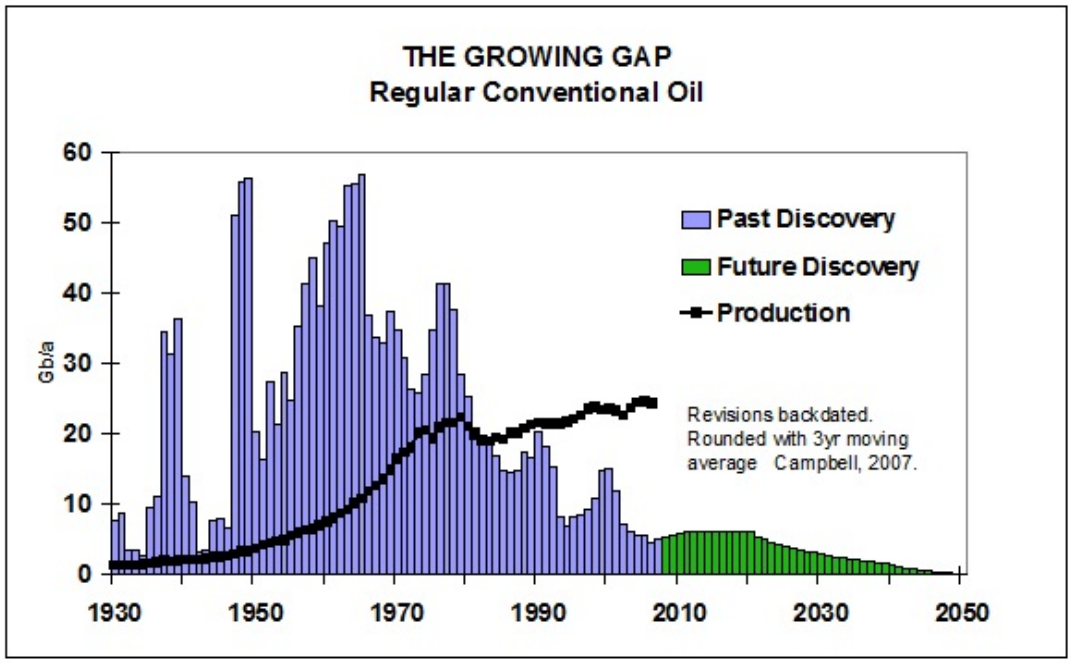

Figure 4. World Oil Production vs Discovery, Regular Conventional Oil, 1930-2050

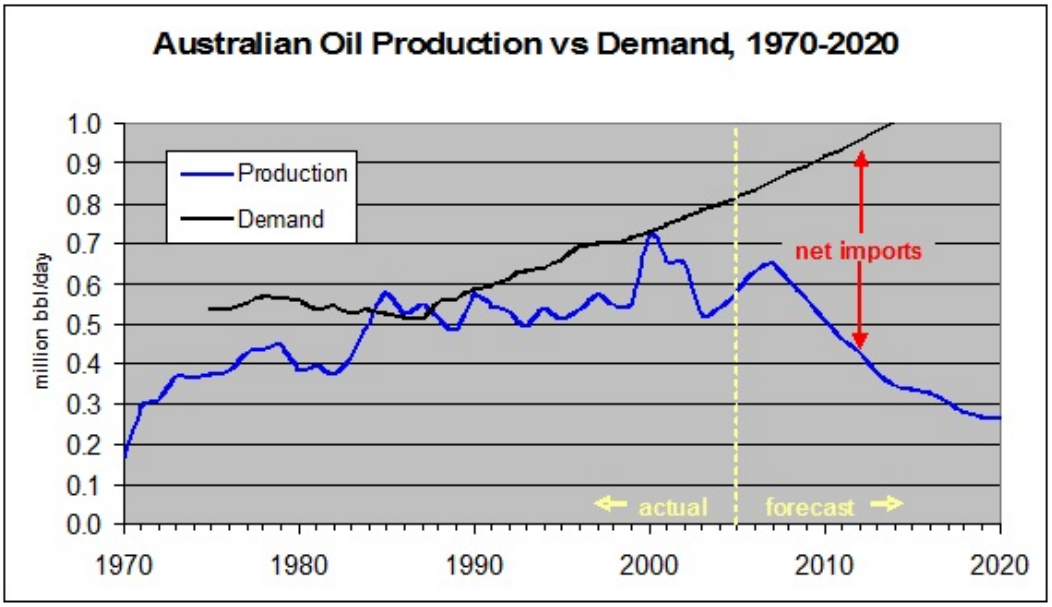

Figure 5. Australian Domestic Oil Production (Geoscience Australia, actual and P50 forecast) vs Total Demand (ABARE), 1970-2030

A similar approach to combining resource based and projects based methodologies has been taken by the IEA in its review of oil and gas supply prospects for WEO 2008. This assessment has

included a detailed field-by-field analysis of trends and prospects for production and decline rates at more than 400 of the world's largest fields and a comprehensive review of reserves and resources.9 A first draft of WEO 2008 was due to be released for peer review on 1 August. While we are not privy to the contents of the report, IEA Chief Economist Dr Fatih Birol has for some time been openly signalling a major downwards revision from previous reports. In March, for example, Birol wrote in The Independent: "we need to leave oil before it leaves us."10 IEA reports since WEO 2007 have warned of a "supply crunch" in the 2010-2012 timeframe. Given that many of your key assumptions are based on projections from WEO 2007, we strongly recommend that you obtain the draft WEO 2008 prior to completing your final report.

As an aside, you should bear in mind that the IEA was established by the OECD to counter-balance OPEC and represent the interests of major oil-consuming nations. Unlike the IPCC it is not a broad-based international organisation and in the past there have been serious grounds for doubting the objectivity and reliability of IEA oil forecasts. Although recently the IEA has become more open to oil depletion methodology, Australia should not rely on IEA information alone while neglecting other more independent assessments such as those of Energy Watch Group and ASPO.

The emissions scenarios in WEO 2008 would likely reflect any downwards revision in forecast oil and gas production. You will be aware that the IPCC emissions scenarios discussed in your Draft Report pre-date much of the contemporary literature on oil depletion and therefore take no account of this factor. However a number of published scientific papers now include emissions scenarios based on realistic oil reserve and production estimates. The first of these is Prof. Kjell Aleklett, Reserve Driven Forecasts for Oil, Gas and Coal and Limits in Carbon Dioxide Emissions, OECD Joint Transport Research Centre, December 2007,11 which concludes:

> This paper is based on realistic reserve assessments, and CO2 emissions from resources that cannot be turned into reserves are not allowed. ... we can conclude that CO2 emissions from burning oil and gas are lower than what all the IPCC scenarios predict.

IPCC emission scenarios for the time period 2020 to 2100 should in the future not be used for climate change predictions. It's time to use realistic scenarios.

The second paper is Drs. Pushker A. Kharecha and James E. Hansen, "Implications of Peak Oil for Atmospheric CO2 and Climate", Global Biochemical Cycles, Vol. 22, GB3012, August 2008.12 Kharecha and Hansen present five emissions scenarios, four of which are broadly consistent with the resource based oil production studies cited above. Notably, these four scenarios see peak fuel CO2 levels in the 428-446ppm range. The fifth scenario is a business-as-usual scenario in which fossil fuel emissions are unconstrained.

Even before considering Copenhagen, our view is that this disparity between your emission scenarios and resource limitations discredits much of the analysis in the Draft Report, in particular:

> The Review's 'Platinum Age' projections are based on the IEA's WEO 2007 production forecasts, which have likely undergone significant downwards revision in WEO 2008. The WEO 2007 reference case sees fuel-related CO2 emissions reaching 41 Gt per annum by 2030 (including world oil production at 116 million barrels per day) and continuing to climb, while the high-growth scenario sees emissions reaching 44 Gt per annum in the same timeframe and also continuing to climb. This is completely unrealistic.

Assumptions regarding fossil fuel emissions in the Review's no-mitigation reference case are not yet published, however the projection (Draft Report, Figure 4.10) appears to be demand based and continues to climb beyond 2100, unconstrained by resource limits, exceeding even the higher IPCC scenarios. This too is completely unrealistic.

The no-mitigation scenarios exclude the very serious economic impacts of peak oil on the world economy. The result is that the mitigation scenarios grossly overestimate the cost of mitigation while omitting the severe costs of delaying mitigation until the onset of peak oil. These are described in a 2005 report commissioned by the US Department of Energy ("Hirsch Report"):

How Oil Supply Shortfalls Affect the Global Economy

> Oil prices play a key role in the global economy, since the major impact of an oil supply disruption is higher oil prices. Oil price increases transfer income from oil importing to oil exporting countries, and the net impact on world economic growth is negative. For oil importing countries, increased oil prices reduce national income because spending on oil rises, and there is less available to spend on other goods and services. Not surprisingly, the larger the oil price increase and the longer higher prices are sustained, the more severe is the macroeconomic impact.
>
> Higher oil prices result in increased costs for the production of goods and services, as well as inflation, unemployment, reduced demand for products other than oil, and lower capital investment. Tax revenues decline and budget deficits increase, driving up interest rates. These effects will be greater the more abrupt and severe the oil price increase and will be exacerbated by the impact on consumer and business confidence.

Implications for the World Economy

> A shortfall of oil supplies caused by world conventional oil production peaking will sharply increase oil prices and oil price volatility. As oil peaking is approached, relatively minor events will likely have more pronounced impacts on oil prices and futures markets.
>
> Oil prices remain a key determinant of global economic performance, and world economic growth over the past 50 years has been negatively impacted in the wake of increased oil prices. The greater the supply shortfall, the higher the price increases; the longer the shortfall, the greater will be the adverse economic affects.
>
> The long-run impact of sustained, significantly increased oil prices associated with oil peaking will be severe. Virtually certain are increases in inflation and unemployment, declines in the output of goods and services, and a degradation of living standards. Without timely mitigation, the long-run impact on the developed economies will almost certainly be extremely damaging, while many developing nations will likely be even worse off.

With the world oil production trend merely on a plateau rather than in decline, i.e. even before there is conclusive evidence of it having peaked, the IEA has already observed "devastating" demand destruction in the US and other OECD countries, contributing substantially to a slowdown in the global economy,15 while Jeff Rubin has calculated that the impact of rising oil prices on global transport costs in recent years has effectively offset all of the trade liberalisation

efforts of the past three decades.

The no-mitigation scenarios also exclude the economic impacts of peak oil on the Australian economy, while the mitigation scenarios similarly overestimate the cost of mitigation and omit costs of delaying mitigation. Based on a near-term peak in world oil production, recent modelling for the CSIRO Future Fuels Forum indicated fuel prices as high as $8 per litre by 2018, a reduction in passenger and freight travel of up to 40 per cent and a decline in GDP of at least three per cent,17 which dwarfs the deviation between your reference case and ambitious 450ppm mitigation scenario in Targets and Trajectories. Observed data indicating the impact of rising oil prices includes an increasing petroleum trade deficit that already exceeds $10 billion per annum, the combined impact of rising oil prices and personal debt in the car-dependent outer suburbs of Australia's cities,18 high inflation and slowing economic growth.

Numerous unsubstantiated assumptions are made regarding energy resource substitution. Constraints imposed by the laws of thermodynamics, time and scale appear to have been ignored. The magnitude and urgency of the "energy transformation" (Draft Report, Chapter 20) is grossly underestimated.

While we accept that the purpose of the Review is to develop a policy response to climate change rather than peak oil, we believe that failing to respond to the latter will preclude an effective response to the former. Placing a price on carbon via the cap and trade system proposed in your Draft Report is important, however this in itself will be grossly inadequate as there is little evidence to support the assumptions regarding timely energy resource and technological substitution. The Hirsch Report examined the specific problem of developing alternative liquid fuels to mitigate a liquid fuel shortfall following peak oil. Three mitigation scenarios were developed, based on different timings for the implementation of comprehensive supply-side and demand-side "crash programs" including enhanced oil recovery (EOR), heavy oil production (such as tar sands), gas-to-liquids (GTL), coal-to-liquids (CTL) and fuel efficiency gains. The conclusions are instructive:

> Waiting until world oil production peaks before taking crash program action leaves the world with a significant liquid fuel deficit for more than two decades.
>
> Initiating a mitigation crash program 10 years before world oil peaking helps considerably but still leaves a liquid fuels shortfall roughly a decade after the time that oil would have peaked.
>
> Initiating a mitigation crash program 20 years before peaking appears to offer the possibility of avoiding a world liquid fuels shortfall for the forecast period.
>
> The obvious conclusion from this analysis is that with adequate, timely mitigation, the costs of peaking can be minimized. If mitigation were to be too little, too late, world supply/demand balance will be achieved through massive demand destruction (shortages), which would translate to significant economic hardship.

When the combined peak oil and climate change mitigation problem is given even precursory consideration, compounding problems emerge, for example competition for liquid fuels between the transport and stationary energy sectors, or attempts at large-scale substitution of petroleum fuels with emissions-intensive coal-to-liquids or biofuels from food crops. A useful "cost comparison" between climate change mitigation and peak oil mitigation is to be found in the CSIRO Future Fuels Forum modelling, which found that a very high carbon cost of $100 per tonne would increase the cost of petrol by 25c per litre, whereas a near-term peak in world oil production would see the cost of petrol increase as high as $8 per litre.

Without urgent, comprehensive intervention, a purely market based response to climate change will most likely fail to deliver the necessary energy and transport infrastructure before declining oil production precludes such a transition. Even without considering the broader economic consequences, the construction costs alone arising from an increase in fuel prices to anywhere near $8 per litre would be prohibitive. Our dependence on existing, fossil fuel dependent transport and energy infrastructure would likely become more deeply entrenched, thereby exacerbating the already "diabolical" emission reduction challenge.

There is a large overlap in potential policy responses to climate change mitigation and peak oil mitigation. One of the key differences between the two, however, is that there is no "prisoners dilemma" to prevent unilateral peak oil mitigation. Indeed most peak oil mitigation measures would be 'no regrets' policies with positive socio-economic outcomes. Several Australian constituencies, including the Queensland Government, have for this reason already begun the process of proactive, unilateral peak oil mitigation.20 Given that Australian domestic oil production peaked in 2000 and we are already almost 50 per cent dependent on petroleum imports, the Commonwealth Government has nothing to lose in following Queensland's lead.

The Copenhagen negotiations will be occurring at a time of growing awareness of peak oil. Most countries are becoming increasingly aware of the economic and security problems arising from their growing dependence on oil imports, notably the US, the UK, China and India. The imperative for unilateral peak oil mitigation in concert with a cooperative climate change mitigation effort is becoming more widely understood, even within the climate science community. The IEA's reserve based energy and emissions forecasts are being revised towards realistic scenarios more consistent with a 450ppm emissions target. Prospects for an effective agreement in Copenhagen around this target appear to be improving by the day.

We would be pleased to discuss this matter with you at your convenience and look forward to your final report.

Stuart McCarthy

You can download the full document including references from ASPO Australia.