Key Issues: Oil and Gas Depletion, and Alternatives

Submission to the Select Committee on the Impact of Petrol Pricing

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This document provides references to the research that substantiates the claims I made in my verbal submission.

Oil

Oil production in Australia peaked in 2000 and we will need to import close to 70% of our oil by 2010[1].

Globally oil production will begin declining within the decade, probably by 2010. Because of the time lag between exploration, discovery and bringing projects online we know that unless there is demand destruction there will be a global shortage of oil supply relative to demand by 2007[2]. Higher prices are the easiest way of reducing demand. We need to reduce our reliance on oil, not demand lower prices.

Within 30 years all oil liquids production will be 35% less than it is now, and conventional oil production will be around 40% of current levels[3]. Almost 80% of oil used in Australia is for transport[4]. The chemical industry relies on cheap oil and natural gas. The availability of oil in the near future cannot be guaranteed, nor can its affordability.

Gas

Whereas oil distribution is a global market, gas is primarily a local or regional market. Gas is already peaking in the US and due to their dependence on gas-fired power stations for peak electricity load they are facing an immanent electricity crisis. Globally, gas production will peak in 12 – 17 years.

World food production has doubled over the past 40 years as a result of fossil fuel based fertilizer, pesticide, and herbicide inputs. Fertilizer is made from natural gas. Fertilizer manufacturing is one of the first gas-based industries to shut down with higher gas prices. US fertilizer factories shut down during 2000 and they shut down again in 2003, both times due to rising gas prices.

Currently Australia feeds 85 million people. Declining fossil fuel inputs[5] (that reduce agricultural and other outputs[6]) and higher transport costs can be expected to negatively impact an export oriented remote economy like Australia[7].

Global Warming

Scientific experts are warning we need to reduce greenhouse gas emissions by 60% - 80% if we are to avoid global warming (a 6 degree temperature rise in the Permian was responsible for the extinction of about 90% of life on earth[8] - this is at the upper end of climate predictions about rising temperatures if we don't reduce our emissions now. Higher prices for fossil fuels is one of the most effective means of achieving this. We should be supporting higher prices for fossil fuels like oil.

Alternatives

Biofuels

Biogas, ethanol, methanol, and biodiesel may be able to replace fossil fuels at either current population levels or at 1/3 of projected future energy consumption per person[9].

Hydrogen

Hydrogen may be suitable for some purposes, however, the decentralised generation of hydrogen to replace current liquid fuel consumption would require around 3 times current electricity generation capacity.

Appropriate Response

- Conserve LNG for future domestic use
- Reduce consumption of oil and gas
  - Energy efficiency measures
  - Replace road freight with rail wherever possible - we need to find ways of funding that recognise the positive externalities associated with rail and public transport.
  - Develop urban planning guidelines that make walking, cycling and public transport the easiest and favoured option
  - Foster Community Supported Agriculture (CSA) schemes to support local agricultural production for local consumption
  - Develop settlement patterns and practices to reintegrate nutrient cycles from food production to consumption
  - Remove hidden tax subsidies for roads and fossil fuel based transport
  - Correct market neglect of positive externalities associated with public transport, walking, and cycling

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[1] Australian Energy News, March 2002, Issue 23

[2] 'Oil field mega projects 2004', *Petroleum Review*, January 2004, 18-20. And 'Depletion now running at over 1mn b/d' *Petroleum Review*, August 2004, 42-44.

[3] Bruce Robinson and Sam Powrie, 2004 'Oil depletion: the crucial factor in transport planning', 27th Australasian Transport Research Forum, Adelaide September, 2004. p4. http://www.stcwa.org.au/BO2/ATRF-OilDepletion.pdf

[4] Bruce Robinson and Sam Powrie, 2004 'Oil depletion: the crucial factor in transport planning', 27th Australasian Transport Research Forum, Adelaide September, 2004. p2. http://www.stcwa.org.au/BO2/ATRF-OilDepletion.pdf

[5] Modern agriculture is basically a nutrient extraction industry. Inputs based on fossil fuels are essential for maintaining this system. (See Folke Gunther 1997 'Hampered Effluent Accumulation Processes: Phosphorus Management and Societal Structure'. Ecological Economics, 21, 159-174, archived at: http://www.holon.se/folke/written/stuff/Heap/heap.pdf) The only way of sustainably maintaining soil nutrient levels without these inputs is to reintegrate the humanure by products of food consumption with the process of food production. The greater the distance between food production and consumption the more energy expensive this process is. The tighter the link, the more responsibility people will take for what goes in the 'waste' stream. 'Local production for local consumption' both reduces transport costs of food, and makes it easier to reconnect the nutrient cycle from production to consumption and back.

[6] Rich Pirog, Timothy Van Pelt, Kamyar Enshayan, & Ellen Cook 2001, in their 'Food, fuel, and freeways', (Leopold Centre for Sustainable Agriculture, Iowa, archived at: http://www.leopold.iastate.edu/pubinfo/papersspeeches/food_mil.pdf) showed that food reaching Chicago from the global food industry travelled an average of 2442 km in 1998, compared with an average of 71km for locally produced and consumed food products. I read something else that said food travelled an average of either 15m or 15km at the turn of the century (have to find the reference). Folke Gunther reports research showing that food transport accounted for 10% of energy use in Sweden in 1976 (in his 2001 'Ruralisation – Integrating Settlements and Agriculture to Provide Sustainability',

Proceeedings seminar no 327,Copenhagen, Aug 2001, p81-96, accessed at: www.darcof.dk/publication/rapport/dar_3.pdf). If we combine this figure with the 22% increase in transport miles since 1981 (from Pirog et al above), the figure would be more like 12%. Because air freight uses over 20 times the fuel energy of rail or sea freight, rising fuel prices (or reduced availability) will impact this sector of the economy first.

[7] See Barney Foran & Chris Mardon 1999 ('Beyond 2025: Transitions to the biomass-alcohol economy using ethanol and methanol', CSIRO Wildlife and Ecology, Canberra, archived at: http://www.cse.csiro.au/research/Program5/publications/99-07.pdf). Their Scenario 4 'methanol plus radical economy' model is the source of the 33% figure.

However, this model puts aside the problem of maintaining soil fertility beyond 10 years of biomass harvesting, (see Folke Gunther, 1997, above) and does not do more than indicate that sustainable use of water resources may impose greater limits on biomass harvesting and processing (p14). (Need figures from Vic research showing that regularly harvested forests significantly reduce yields from water catchments (%), while mature forests increase yields from water catchments. Both reduce salinity, but water may prove a more important limiting resource, not fuel. An adequate model of biofuel alternatives needs to model energy and nutrient and water flows.)

The model also assumes that the cost of treating wastewater from producing biofuels will be negligible. Mario Giampietro and Sergio Ulgiati (in their 1997 'Feasibility of Large-scale biofuel production', Bioscience, Oct97, Vol 47, Issue 9, p587-600) argue that the BOD of the water used in a 300,000 L/d ethanol plant is 'equivalent to the domestic sewage of a city of 2 million people', and that its processing would require approximately 50% of the energy supplied by the ethanol. While the quantum may or may not be as large for methanol processing, the methanol produced from the 100 million tonnes of wood, proposed in Scenario 4, could have a sewerage load in the order of 30,000 million people. (Whether Australia actually has the water resources to do this, in the absence of more detailed analysis, is prima facie implausible, especially when it is acknowledged that growing the woody biomass actually reduces water availability).

Scenario 4 envisages 100,000 direct jobs in methanol production. While this is only 1% of current employment, it is not clear how many extra people would be employed indirectly. Figures would be useful. Giampietro and Ulgiati (above) point out that any significant increase in the proportion of the population employed in energy production involves a major change in the economy. In this case, it would involve the beginnings of a reversal of last century's flow of population from rural activities to urban activities. The need to replace fossil fuel fertilizers with organic practices (which are also more labour intensive) will exacerbate this tendency. Rural labour tends to be more poorly paid and harder physical labour than urban occupations. It is not likely to be an option that is freely embraced.

Finally, the methanol production in Scenario 4 is based on a 20+yr plantation harvesting cycle, while oil experts predict that conventional oil production will begin to decline before the end of the decade. (The simulation of oil production in Fig 5.2 of the Foran & Mardon report, which shows increasing Australian production until 2025, then an abrupt halt of Australian oil production, is completely at odds with all empirical data on production rates in depleting oil fields. Australian oil production began declining in 2000, and the rate of production will continue to decline as our fields deplete. Unless we reduce consumption we will either become increasingly dependent on declining global oil supplies, or the pressure to log mature forests will increase.

[8] http://news.bbc.co.uk/2/hi/science/nature/4184110.stm

[9] See Baldur Eliasson and Ulf Bossel 'The future of the hydrogen economy: Bright or bleak?' accessed at: www.nrel.gov/ncpv/hotline/pdf/hydrogen_economy.pdf . It is unlikely that current levels of electricity generation can be met with renewable sources. The electricity requirement for replacing transport fuel with hydrogen is even less feasible. Methanol is more easily transported, and provides a greater energy return than hydrogen (see summary at http://www.stcwa.org.au/news/1052977014_1948.html .)

Dr. Jorg Wind speaking for Daimler Chrysler at the 2nd International Workshop On Oil Depletion, Paris, France, May 26-27 2003, had little optimism that fuel cells would ever amount to a significant market share.