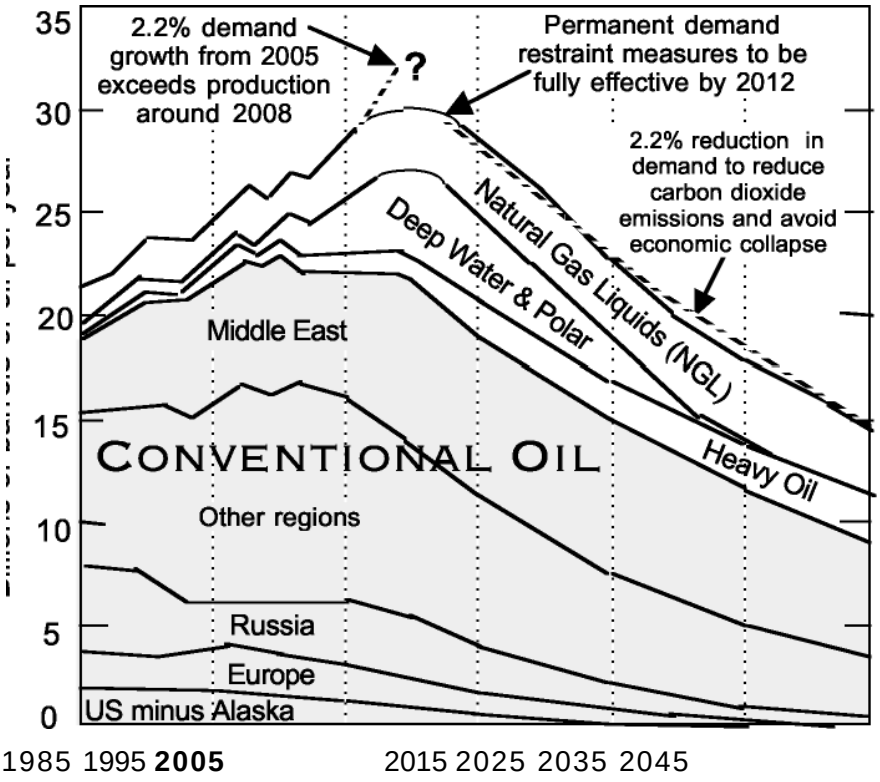
The 2nd Submission to the Productivity Commission regarding the Draft Report on Energy Efficiency April 2005

By Alan A. Parker

Affordable World Oil and gas liquid production from 1985 to 2045: Showing 2.2% demand restraint to cope with declining production



Source: Oil production data from the April 2005 newsletter of the Association of the Study of Peak Oil www.asponews.org **Note:** there are other sources of oil, not shown above, that will be available at about the time that oil production" peaks. However to exploit the oils from shale oil and tar sands, very heavy oil or methane hydrates will more double the amount of greenhouse gases released. The Australian governments view that there is enough oil for the next 30 is based on the fact it is prepared to massively increase CO2 emissions.

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Summary key issues in the first submission.

The 1st submission focused on Australia's energy wasteful passenger transport system and why an 'energy efficiency gap' exists between the most efficient means of passenger transport and those that are actually in use. It stated that this had generated a high degree of oil/car dependency and puts the nation at risk of economic collapse some time between 2008 and 2024 and that there was a need for a 'cradle to the grave' assessment of the energy efficiency of passenger vehicle fleets today and in 2024 when the energy efficiency of the "fuel chain" will be greatly reduced. It stated that the "energy return on energy invested", also known as the energy profit ratio, in extracting the available high cost oil left from difficult locations in deep water or from energy intensive, low quality resources, such as heavy oil and tar sands will decrease. By 2024 the physical energy costs of exploring, extracting, transporting, refining and distributing oil and gas based fuels, may not be competitive with sources of renewable energy such as wind turbines, solar cells and electricity production from brown and black coal. (Foran and Poldy 2002 A)

Introduction to the Second submission.

The second submission follows up on the 1st Submission and is focused on oil and transport energy efficiency issues that the Draft report report fails to deal with and some of the gross errors of fact such as the statement that average fuel average fuel efficiency of the car fleet has decreased steadily from 11 litres per 100 km to 8 litres per 100 km today. and suggesting that fuel efficiency will improve without any intervention by government. When the data clearly shows that after 2002 it started to increase from 9 litres per 100 km and is on an upward trend due to the greater use of heavier vehicles and SUVs which is likely to continue to at least 2010. There is absolutely nothing in the recommendations of the draft report that will change that as the trends in the ABS data for the journey to work in the congested peak hours clearly shows. See figure 3 pages 7 & 8 (Parker 2004).

The focus of this report is on the actual recommendations of the draft report for the transport sector, which even if implemented would do little to increase the energy efficiency of the transport sector, leaving the country vulnerable to disruptions in the supply of affordable oil. The essentially trivial recommendations are the result of ignoring the very wide brief and narrowing it down to a trivial market orientated focus by the Commissioners.

The terms of reference for this Productivity Commission Inquiry into energy efficiency, written by Minister Ross Cameron defined energy efficiency as follows:

"*Energy efficiency in this context refers to maintaining or increasing the level of useful output or outcome delivered, while reducing energy consumption, and encompasses both supply side*

and demand side efficiency .....Further, in defining the scope of the inquiry, he included the improvement of transport related energy efficiency, including, but not limited to, urban planning, congestion pricing, intelligent transport systems, travel demand management, and increased efficiencies in the business and freight sectors (including opportunities for better matching of transport choices with transport tasks undertaken);

This is a very wide brief, and goes well beyond the Parer Energy Market Review and the National Framework for Energy Efficiency, both of which specifically excluded transport. The omission of transport (and agriculture) from those two inquiries was surprising considering the strategic importance of oil to the economy and the lack of any immediate alternatives to oil. However, the Productivity Commission Inquiry Draft Report fails to focus specifically on the growing oil dependence of transport sector despite several submissions showing the need to do so.

The draft report fails to prioritise the energy efficiency change process in a way that will guarantee Australia's need for energy security.

Achieving energy efficiency requires that many actions be taken by individuals companies and the governments who can encourage and discourage energy efficiency in many ways. Achieving energy efficiency is a change process that can be very costly and the resources available for doing that are limited. So it is necessary to identify those improvements to energy efficiency which are crucial to the energy security of the nation. Then it is necessary to consider the options available and what can done. The draft report fails to do that. The greatest threat to energy security comes from the failure to control the growth of oil dependence when world demand for oil is increasing at a rate that has, or will in few years, exceed world oil production capacity which may have a disastrous impact on world trade and the Australian economy.(BTRE 2005) (ASPO 2005)

It states on page 24 that crude oil and other refinery feed stocks account for 35% of Australia's primary energy use but fails to give priority to increased energy efficiency in using and conserving oil given the rising energy cost of extracting oil and other alternative fuels that may become available over the next 20 years due to the peaking of the production of conventional oil world wide. around 2008, and the fact that Australian oil production is past its peak.

The Draft Report fails to make recommendations will actually reduce the 3% growth rate in the demand for oil in Australia due largely to the use of bigger and more power full motor vehicles by Australians in the last ten years. Most of these vehicles are still being used and the large increases in SUVs since 2000 will still be on the roads in the next ten years. This has swallowed up engine efficiency gains and will continue to do so.

On page 30 of the draft report it states that "Energy is in general a small item of expenditure in all of the final energy-using sectors of the Australian economy". This statement is accompanied by a chart showing the transport sector share in energy costs for 1998-99 as

only 4.5%. of expenditure and obviously selected because it was the lowest oil price since 1986 inviting the suggestion that it was selected to deliberately mislead

The fact is that real price of crude priced adjusted for inflation in 2005 was US $15 per barrel in 1998-99 and in 2005 will average out at least 3 times that price, with some expert predictions of US $105 a barrel by 2007. The stated assumption "that oil in general is a small item of expenditure" is not true and fails to recognise the critical importance of energy use to the maintenance and growth of the economy in the longer term when affordable oil is no longer available.

The draft report has no rational science based measure of energy efficiency A

CSIRO study "Dilemmas Distilled" states the following:

The critical importance of energy use to the maintenance and growth of our economic system is not properly acknowledged in most national analysis (that have a short term focus). Long run analysis suggests that energy use is responsible for 50% of production in a modern economy but but represents only 5-10% of the cost. This tension between physical and economic realities effectively blocks the transition to a physical economy with low carbon energy sources". p 28. (Foran and Poldy 2002 B)

It is likely that Australia will be importing more and more oil and if there is any large new oil discoveries they will most like be in deep water requiring far more energy to extract that oil. from Bass Strait. Draft Report it fails to record sound research by CSIRO that the "energy return on energy invested" in finding, extracting, transporting and refining oil will decrease or the fact that the only rational way to measure energy efficiency is to use the "energy return on energy invested" also known the energy profit ratio, as the a key measure.

Not only that but the figure of 4.5% ignores "a cradle to the grave" analysis of the imported and vehicles that require oil to make them, to maintain them, to use then and to recycle them and finally to dispose of them once their useful life is ended. There is also the huge energy input that goes into producing coal, iron and other resources which have to be exported to pay for the parts used to assemble our large cars, SUVs and large trucks needed because of our growing oil dependence. The reality is that any energy efficiency gains from the implementation of the Draft Report would be swallowed up by increasing oil dependence for transport. The free market assumptions about energy efficiency in the Draft Report have no scientific validity and no science based system for measuring energy efficiency is provided.

The draft report quotes the IEA data for energy efficient per unit of GDP on the first page of the overview as follows:-*In Australia (primary) energy consumption per unit of output declined by 18% between 1973 and 2001:*

Measuring energy efficiency per unit of GDP in affluent societies that produce so much effluent, waste and environmental damage may have its uses in crude international

comparisons. However, using it as measure of energy efficiency in an Inquiry that focuses specific energy resource is useless. This is because GDP is a very course measure includes all manner energy wastefull activities: bushfires, car accidents and crime waves all increase GDP, but they don't make us better off.

To have more rational measure of energy efficiency even for international comparisons needs a set of "national well being accounts" so that we can monitor our use of energy in relationship to the growth in well being.. That has been done in very few countries and the data for "growth of well being" for US showed no improvement in energy efficiency at all. On the contrary it showed a decline and US energy efficiency and cannot improve because most of the high quality oil, gas and coal has gone and all that remains are the sour heavy oils, less accessible coal etc. and what remains to extract has a lower energy return on energy invested and huge increases in greenhouse gas emissions. This is shown for oil on figure 1.

The draft report fails to define energy efficiency in way that respects the law of diminishing returns, as the International oil industry moves from larger to smaller oil deposits and from better to poorer quality oil. The improved knowledge and advances in science and technology generally are not going to change that on the contrary they now so improved compared to 20 years ago enable us to know that for oil environmental impacts are going to greatly increase and to provide a measure of the rate. at which the quality of the resource is diminishing.

The IEA's notion that the amount of energy needed to produce a dollar's worth of GDP will decline as 'energy efficiency improves and the global economy relies less on heavy industry's flawed. All that has happened is that heavy industry and much of manufacturing has gone offshore and is rapidly increasing the demand for oil in Asia particularly China. The export of heavy industry and manufacturing does not alter the fact, that as far as affordable oil is concerned, nearly all the low hanging fruit has been picked and in few years

An estimate of energy return on the energy invested for different forms of energy over time from the 1930s to 2024 should be included in the Final Report on Energy Efficiency.

Mandating standards for the improved fuel efficiency of cars and SUVs

In transport we have the growth in car fleets that are bigger and consume more fuel despite the the fact that the worlds best car designers and car manufacturers have created vehicles that could slowly create more energy efficient car fleets that reduce far less oil and in the long term could mostly rely on off-peak main electric charging. However, this will not happen outside of China and Japan, because of economists that are wedded to a neo-con ideological philosophy that is devoid on any rational historical perspective on past achievements in reducing oil dependency and the necessity intervention in the market.

Fuel efficiency standards have been mandated effectively in the past and it could be done again. One of the most respected US presidents who was nuclear engineer was able improve the energy efficiency of the worlds car fleets directly and indirectly by mandating in 1975 improved fuel efficiency for US cars and trucks and which stimulated the car industry world

wide to produce more energy efficient cars for export to the USA. This aspect of the US CAFE standards was not reported in Box 9.1 p 206 of the draft report This change persisted until another President decided that energy efficiency was not important to the US. which has resulted in the average car and light truck fleets becoming less fuel efficient in recent years the standards were not revised and updated as required. (Bezdek & Wendling 2005).

The US mandatory standards was very effective when introduced in the USA by President Jimmy Carter (Energy Policy and Conservation Act of 1975) which required car companies to double the fuel efficiency of their car over phased period of years. When introduced in 1975 the average fuel efficiency of the US car fleet was 18 litres /100 km in 1985 and by 1987 average fuel efficiency of the US car fleet improved and was 9 litres /100 km. The average fuel efficiency of the US car and SUV fleet reduced to 9 5 litres /100 km in 2004. This was due to the increase in the growth in sales of SUVs which were not covered by the car standard but the standard for light truck which was and still is 11.4 litres/100 km (Bezdek & Wendling 2005).

Bezdek & Wendling have recommended that for new cars a new standard be phased in to ensure that by 2015 average fuel consumption of the car fleet would be 5.7 litres/100 km and for the SUV and light truck fleet to be 7.6 litres/100 km. giving an overall 50% increase in fuel efficiency. Compared the petrol electric hybrids on sale in 2005 which have fuel consumption of 5 litres/100 km and which may improve to 3 litres/100 km in few years we may start to see the petrol versus electric ratio shifting in favour of electricity in some models.

Adding battery capacity and plug-in capability for overnight charging are simple modifications to an already-hybridized vehicle. In fact, hybrid owners are already making these modifications <http://www.calcars.org/priusplus.html> themselves and manufacturers have indicated that Plug-in Hybrid Electric Vehicles (<http://www.iags.org/n032805t2.htmpih.htm>PHEVs) may be manufactured as soon as the 2007 model year.

Some models of hybrids vehicles evolve from being gasoline-based with electric assistance into being electricity-based with relatively minor gasoline backup. Why will this happen? Because electricity is cheaper. Electricity is very unlikely to relinquish transportation market share once it has gained it. Electricity is clean, efficient, safe, familiar and cost-effective. An EPRI study found that the majority of people surveyed preferred plugging in a vehicle to fuelling at the gas station <http://www.iags.org/n032805t2.htm#5>

President Jimmy Caters energy efficiency initiatives where well understood by the Japanese ruling bureaucracy in 1974. The oil crisis of 1973 had a deviating effect on their economy for several months. They accepted that national security is about enabling Japan to survive oil shortages; that oil conservation is just as important as having a military capacity and that oil dependence was a serious threat to their way of life. Japan's energy security policy has reduced oil dependence in the transport sector by creating the finest rail system in the world, for urban commuting and intercity transportation, which is sustainable because it is reliant mainly on hydro electric sources (Hook, W. 1994). Intermodal passenger transport is highly

developed with 6 million bicycles being used to access rail stations; very efficient modal interchanges linking buses and trains and providing secure bicycle parking. Japan has introduced legislation requiring the sale of new cars, after four years of use to other countries so that new energy efficient cars, particularly small petrol electric hybrids, will, in a few years, renew their car fleet and make it the most fuel efficient in the world. These energy efficiency spinoffs of the US CAFE standards was not reported in Box 9.1 p 206 of the draft report

In Japan Petrol is A$1.75 per litre, a price high enough to encourage the sale of smaller cars. Electricity generation is heavily dependent on oil and is the reason for Japan planning to generate 40% of its electricity from nuclear power. This electricity can be also used for more high-speed trains and to power electric bicycles which are becoming popular in Japan (Parker 2004 A). Japan has almost zero population growth, has no indigenous oil resources and has been sensibly planning to survive since the 1970s when Japan's elite bureaucracy MITI made important decisions.

President Bush has suggested that tax credits of around A$4000 be provided to consumers to encourage them to buy Japanese petrol electric hybrids for sale in 2005 which have fuel consumption of 5 litres/100 km. An tax initiative along those lines is clearly needed to increase energy efficiency of the Australian car fleet.

For Australian new cars a fuel efficiency standard needs to be phased in to ensure that by 2015 average fuel consumption of the car fleet would be 5.0 litres/100 km and for the SUV and light truck fleet to be 6.5 litres/100 km. giving an overall 50% increase in fuel efficiency.

The changing global mix of oil resource production from 1985 to 2045.

On 9 January 2004, when Shell announced that it had significantly overstated its reserves, its market capitalisation immediately fell by almost £3 billion. As one commentator put it, 'if Shell doesn't know how much oil it has got then it is likely that the world doesn't know how much oil it has got.' Confidence in the world oil market was further undermined by the record high prices (nominal) reached in October 2004.

There is the need to improve the quality, reliability and transparency of oil reserve data. Some steps have been taken over recent years in this regard, although major benefits are yet to be realised. The Joint Oil Data Initiative, the UN Framework Classification for Energy and Mineral Resources and moves by regulators in the U.S. and the U.K. to incorporate external auditing procedures should all serve to improve reserves reporting and strengthen confidence in oil forecasts. (BTRE 2005)

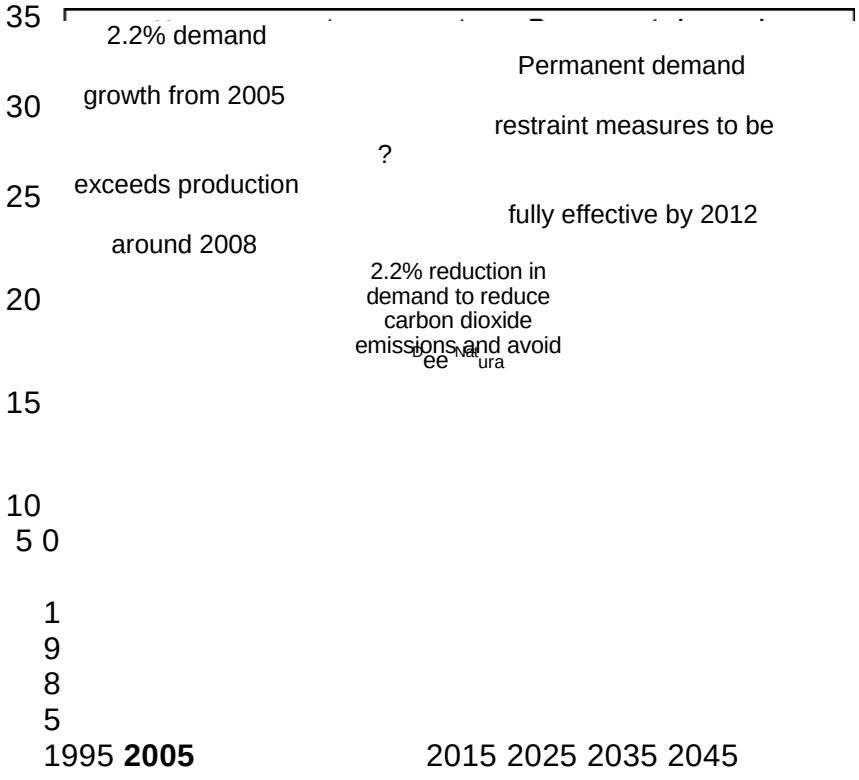
Until such time as more accurate data is available it would be prudent for the Final Report on Energy efficiency should recommend caution and develop a definition of energy efficiency that takes into account the law of diminishing returns and the fact that nearly all the low

hanging fruit has been picked.

Figure 1 shows the changing global mix of oil production from 1985 to 2045. The shaded area I shows conventional oil, natural gas liquids (NGL) It also shows the increasing proportion of heavy oil, oil from deep water and oil from the polar regions which require more energy to extract and refine. The heavy oil shown on figure 1 are an estimate of what is likely to be extracted with current technology . The peak in world oil production is between 2008 to 2012 followed by a 2.2% per annum decline in production to 2045. The reduction in demand needed to balance it with oil production is as follows:

- 2005 to 2008; average reduction of 715 million barrels a year.
- 2009 to 2020; average reduction of 660 million barrels a year.
- 2021 to 2030; average reduction of 616 million barrels a year. .
- 2031 to 2040; average reduction of 515 million barrels a year.

Figure 1 World Oil and gas liquid production from 1985 to 2045: 2.2% demand restraint to cope with declining production



Source: Oil production data from the April 2005 newsletter of the Association of the Study of Peak Oil www.asponews.org

There are other sources of oil, not shown above, that will be available at about the time that oil production" peaks. (Deffreys 2001) However to exploit the oils from shale oil and tar sands, very heavy oil or methane hydrates will more double the amount of greenhouse gases released.

Figure 1 could change for the better if sequestering CO2 in oil fields that are sealed increases the volume of oil that can be extracted by a small but significant amount and that is not shown on figure 3. The same sequestration technology may be applicable for treating some of the very heavy oil to make it less viscous and extractable, to kerogen extracted from shale or oil produced from tar sands. However that cannot apply to most of tar sand and shale oil reserves. The potential of these resources all of which create more CO2 and pollutants are dealt with later. The reason for considering what is known about the more costly alternatives to conventional oil is the unreasonable level of technological optimism of implicit in the Draft Report.

The Australian governments view that there is enough oil for the next 30 years is based on the fact it is prepared to massively increase CO2 emissions. A new report (BTRE 2005) reveals that there are serious doubts about about the view that there is enough oil of any kind or non-conventional source for the next 30 years.

IEA oil emergency demand restraint measures for developed countries are needed.

If world demand for oil is not to exceed production in the next 30 years so that the price of oil becomes unaffordable for basic necessities and food production in many countries, then demand restraint measures (see table 4) which are detailed in an International Energy Agency report will be required.(IEA 2005)

From 2005 to 2040 a reduction of 15.5 billion barrels of oil and NGL (that's 55% of 2005 world OIL consumption) is needed to stabilise prices. It's theoretical possible to make that happen, through demand restraint measures which are summarised on table 4 and detailed in International Energy Agency(IEA) report "Saving Oil in a Hurry: Measures for Rapid Demand Restraint in Transport" which is available as a pdf (IEA 2005 B) file on their web

The IEA report provides a new, quantitative assessment of the potential impacts and costs of oil demand restraint measures in transport, under the conditions of a supply disruption or other oil-related emergency. In short, there appears to be opportunities to achieve substantial reductions in transportation oil demand quickly and cheaply – if national leaders are prepared to act and sell politically unpopular demand constraint measures to their people.

The IEA has recommended technical solutions for the restraint of mostly urban road transport that could could reduce oil demand on their own without any restraint of intercity freight and air travel of fixed sources of oil use. (See table 1) However, the political reality is that you cannot have your cake and eat it. Many national leaders like Bush and Howard think they can have have continued economic growth above 3% per year without any demand restraint measures to reduce urban car use. and the growing dependence on oil.

Fortunately many IEA member countries and non-member countries alike are looking for ways to improve their capability to handle market volatility and possible supply disruptions in the future. This report aims to provide assistance. Some measures may make sense under

any circumstances; others are primarily useful in emergency situations. All can be implemented on short notice – if governments are prepared. The book examines potential approaches for rapid uptake of telecommuting, "eco-driving", and car-pooling, among other measures. It also provides methodologies and data that policy makers can use to decide which measures would be best adapted to their national circumstances.

Table 1 . Summary of oil saving effects of demand constraint policies for passenger transport summed across all IEA countries

Potential oil saving by measure	Measure
VERY LARGE 370 million barrels a year	**Car pooling:** large program to designate emergency car pool lanes along all motorways, designate park-and-ride lots, inform public and match riders. --- **Driving Ban:** Odd even license plate scheme. Provide police enforcement appropriate information and signage. --- **Speed limits:** reduce highway speed limits to 90 km/hr. Provide police enforcement or speed cameras appropriate information and signal.
LARGE 185 million barrels a year	**Transit:** free public transport (set fares to zero) --- **Telecommuting :** large program, includes active participation of businesses, public information of of benefits of tele commuting, minor investment in infrastructure to facilitate. --- **Compressed work week:** Program with employer participation and public information campaign --- **Driving Ban:** 1 in 10 days based on license plate, with police
MODERATE More than 36 million barrels a year	**Transit:** 50% reduction in public transport fares. --- **Transit:** increase week end an off peak service and increase peak service bh 10%. --- **Car pooling:** small program to inform public and match riders. --- **Tyre pressure;** large public information programme.
SMALL Less than 36 million barrels a year	**Bus Priority:** convert all existing car pools & bus lanes to 24 hour bus priority usage and convert some other lanes to bus only lanes

The IEA has recommended technical solutions for the restraint of mostly urban road transport that could could reduce oil demand on their own without any restraint of intercity freight and air travel of fixed sources of oil use. (See table 4) However, the political reality is that you cannot have your cake and eat it. Many national leaders like Bush and Howard think

they can have have continued economic growth above 3% per year without any demand restraint measures to reduce urban car use. and the growing dependence on oil.

All that has been written about energy efficiency of the car fleet in the draft report ignores that the high costs of urban congestion are caused by the inefficient passenger occupancy rates of the vehicles. Energy efficiency also needs to be measured in terms of passenger kms travelled what the IEA suggests for car pooling as a means increasing energy efficiency per passenger km. If car pooling on the scale envisaged by the IEA on table 1 is not a sound energy efficiency measure this writer will eat his hat. Odd and even number plate driving bans may also be applicable as well in to the CBDs of Sydney Melbourne and Brisbane and the free public transport would sure as hell create a shift to electric traction. Cl;early, the IEA is starting to takes potential oil shortages seriously but the draft report shows no evidence of that.

Fortunately many IEA member countries and non-member countries alike are looking for ways to improve their capability to handle market volatility and possible supply disruptions in the future. This IEA report aims to provide assistance. Some measures may make sense under any circumstances; others are primarily useful in emergency situations. All can be implemented on short notice – if governments are prepared. The book examines potential approaches for rapid uptake of telecommuting, “eco-driving”, and car-pooling, among other measures. It also provides methodologies and data that policy makers can use to decide which measures would be best adapted to their national circumstances.

This demand restraint “tool box” may help countries to complement other measures for coping with supply disruptions, such as use of strategic oil stocks. It would be prudent to introduce these restraints now well before crude oil prices go way beyond US$ 105 per barrel around 2007/8 because there is serious risk of economic chaos and 1930's levels of unemployment. The longer national governments wait to introduce IEA demand restraint measures the greater the risk to the economic security of all nations.

The IEA recommendation for reducing the demand for oil are excellent short term measures. However in the transportation sector, the obvious long term means for reducing the probability of interruption of oil supplies exist:

- diversity of vehicle fuels and accellerated introduction of hybrid vehicles

- and stockpiling of fuels and conserving fuel by using public transport walking or cycling instead of driving..

Diversity of fuel supplies acts as an insurance against various kinds of problems. Diversity of plant technology, for example, reduces the risk that basic design flaws in a certain technology might cause a large share of the total generation capacity to be shut down for repair or retrofitting. Similarly, diversity of fuel types or sources of supply can minimise the impact in case the supply of one fuel or from one source is interrupted. It is concluded that frugality and conservation of strategic domestic reserves of oil are essential to our national

security and just as important as our military capacity. An energy security policy is needed that will reduce oil dependence in the transport sector.

The Australian Commonwealth , and the agencies that serve it, have a commitment to the IEA and an obligation to take its report seriously. The overall perspective of the Draft Report is fundamentally flawed as it fails to define energy efficiency in terms of passenger km travelled or in terms reducing the demand for oil.

Green taxes to decouple the growth in oil consumption from the growth of GDP

The growth in the number of 4WD's and SUV's in the Australian and US car fleets, used as single occupant commuting and shopping vehicles, is a most energy wasteful (and dangerous) trend that has already contributed to a 10% increase in oil consumption between 1994 and 2004 with more to come. There is a way of reversing that trend. The national peer review of the Netherlands transport system by the OECD (European Conference of Transport Ministers) identified the Netherlands as being the best passenger transport practice for the EU (ECMT 2001). Indeed the Dutch have been moving slowly towards ecologically sustainable development with their National Environment and Policy Plan by:

"*decoupling economic growth from the growth in fuel consumption and finite resources. (N.E.P.P.* 3. 1998)

As these plans evolved the Dutch greened their tax system as well as providing the infrastructure to improve the performance of their transport system. NEPP 3 makes it very clear why non-motorised travel is considered to be so important and why the car, which in the 1960s and 1970s was regarded as a sacred cow and still is in Australia, is now subject to many regulatory constraints. The transport objectives of the NEPP are:

- Vehicles must be as clean, quiet, safe and economical as possible.
- The choice of mode for passenger transport must result in the lowest possible energy consumption and least possible pollution.
- The locations where people live shop, work and spend their leisure time will be co-ordinated in such a way that the need to travel is minimised.

Without the NEPP it was expected that car kms would increase by 72% over the period 1986 to 2010. With the NEPP this increase will be lowered to 48%, a positive step towards ESD. Dutch experience with implementing the NEPP suggests that there is the potential for a shift of at least 10% of all "drive alone" commuter trips to multiple occupant trips.(Parker 2001) This is in addition to using bicycles to substitute for short, highly polluting car trips. (Wellemen 1999) When considering economic efficiency in the passenger transport sector the overall energy efficiency strategy should be focussed on the transport objectives of the NEPP as stated above. Monitoring the growth rate of car kms and light commercial vehicle kms every two years in Australia would be a useful way of measuring any reduction in energy wasteful activity.

Their experience shows that Greening the tax system could provide incentives and constraints to use cars less so that tax reform results in the conservation of oil reserves and the use of more energy efficient vehicles which will reduce in greenhouse gas emissions. It would be based on the principle that the polluter must pay and that the overuse of petrol and diesel fuels is harmful to the environment and the economy. It would be applied within the context a "National Energy Security Plan" in the following ways:

1. The internalisation of environmental costs. The future costs of oil depletion need to be built into the price of diesel, petrol and aviation fuel so as to encourage fuel conservation, the purchase of more fuel-efficient cars, LCVs, trucks and aircraft.
2. Reduce the long lead times in adapting to oil depletion by increasing fuel taxes every year to pay for the introduction of alternative fuels, particularly gas, and to build the infrastructure needed to encourage walking cycling and public transport.
3. For those who cannot do without cars for essential purpose in business, or are disabled, provide tax incentives for the ownership of more energy efficient cars and disincentives to the ownership of large cars and 4WDs in urban areas.
4. Provide incentives for telecommuting; informal and formal sharing of cars; and innovative forms of car leasing such as the Dutch "Call-a-Car" scheme. Eliminate subsidised car parking and provide incentives for commuting by bicycle.
5. Establish the general principle that car travel to and from work is a personal expense. Salary packaging for commuting, or for vehicles owned by other family members, will not be subsidised. Season tickets on public transport and the provision of bicycles for commuting and/or work business should be salary packaged instead.

The achievement of the 'big picture' planning and transport outcomes induced by the Commonwealth "Greening" of the tax system, would be dependent on state funding and investment being radically changed so that they reinforce and complement these tax reforms.

Polluting alternative resources of non-conventional oil and gaseous fuel

Using heavy oil, oil from polar regions and from deep water, tar sands and shale oil are all more expensive and create more emissions than conventional oil. Some of the technologies for exploiting these oil resources are well developed others are not .

Heavy oils make up half of the worlds known oil reserves much of it is left in the ground after discovery especially when saturated with sulphur compounds and toxic contaminants. Even when heavy oil can be extracted refining it costs more and produces more CO2 emissions. As the proportion of conventional oil decreases once oil fields have passed their peak more energy is needed to extract it as it become sourer and with more impurities. It is costly to in pump in sea water, emulsions etc. to thin-up the heavy oil and enable it be extracted and them separate the oil from the additives. The heaviest oil is what is left behind after the cheap oil has been pumped out and the wells are sealed off .

That so much was left underground did not seem to matter even ten years ago, but today with much higher crude oil prices in 2004 and 2005 and with even higher prices to come, the

development of new techniques to thin-up more of thick heavy oil is worthwhile. One fascinating area of research is focusing more on using new bio science techniques trialled in laboratories with bacteria that literally eat the thick dirty dregs of heavy oil and turn it into something that is less viscous making it possible to open up old oil wells extract more oil or to postpone the closing down of oil wells. The oil industries is now turning to micro biologists for practical help. (Pearce , F. 1999)

Some bacteria can live happily underground devouring the thickest crude contaminated with sulphur compounds and heavy metals. Some of the best bugs for doing this have been discovered in sulphurous environments of slag heaps and boiling mud holes in New Zealand. In theory the process is simple enough it involves mixing a water-soluble catalyst, with the bugs air and water. Most oil fields are awash with water coming up with the oil so you add bugs and stir. Once the process is fully developed with a range of range of bacteria specifically adapted to consuming different types of heavy oil it will be possible to inject them into oil fields. It like a microscopic version of worms turning a pile of crude composting materials into soil, only the bugs produce a extractable liquid with a high oil content. This not a new idea it goes back to experiments in the 1940,s and the best description of more recent development was a New Scientist feature article. (Pearce , F. 1999)

However, there are other sources of oil or combustible gases which may be even more expensive, create more water pollution and greenhouse gas emissions. The technology of extracting oil from shale and tar sands has greatly improved in the last 20 years and production costs in 2004 are one third of what they were in 1984. The USA has 72% of the worlds major oil shale reserves and has one trillion barrel's of proven reserves. Canada has similar amounts of oil reserves in tar sands. Sequestering CO2 is new development that the international oil industry has begun to research that may increase the volume of oil extracted from existing oil fields and wells that have been closed down by a small but significant amount

Another gaseous energy resource that is many more years away from mass exploitation and about which even less in known about are the hazardous environmental implications of “Methane Hydrates”. which are are under Arctic tundra or in deep water.

The problem with enhanced extraction of heavy oil

The sea water, emulsions and chemicals use to enhance the extraction of heavy oil all produce waste and contamination when pumped back to the surfaces. This also applies to the use of bacteria for this purpose. The waste from this biological process will have to be removed. The bacteria will need to be filtered out of the water for recycling and the waste water containing sulphur and organic salts will have to go somewhere.

The problems with the extraction and processing of Tar sands

Misuse of resources: it costs a lot of money and natural gas to unstick the oil from the grains of sand so the net energy gain is small with minimal energy return on energy invested. In the

book *"The Party's Over"* (Heinberg 2003) which looks at future energy supplies and the consequences of using tar sand sands, it states that :

"the waste water pond of one of the tar sands processor, Syncrude, is 4.5 miles in diameter and twenty feet deep it would take 350 similar plants to meet the world's oil needs" .
That would require 14,410 square km of Pond or a water area 7.4 times as big as Port Phillip Bay with an average depth of 6.5 metres. The other problem are as follows:

- Climate change: the greenhouse gas emissions from uncovering, extracting, refining, upgrading and transporting tar sands oil are many times more than they are for conventional oil and gas, or even coal.
- Environmental destruction: Shell's tar sands process requires the stripping of the soil and rock from hundreds of thousands of acres of land to get at the bitumen 200 feet or more under the surface. Forests, wildlife habitat and water sources are ruined. when the used water is discharged causing oil and phenol contamination far beyond the strip-mine site.
- Air pollution: discharges from the processing and refinery upgrade facilities can spread large amounts of toxic and carcinogenic compounds over a wide area.
- Water pollution: A lack of water and disposing of polluted waste water will limit tar sand processing. and while the reserve are huge they can only be extracted slowly.

The problems with the extraction and processing of shale oil

Shale oil has similar environmental problems and according to the World Energy Council what is contained in shale is not oil at all but kerogen which requires hydrogen to be added to it and large inputs of energy to cook it at high temperature to produce a useful fuel:

> *The term "oil shale" is a misnomer. It does not contain oil nor is it commonly shale. The organic material is chiefly kerogen, which can be converted into a substance somewhat similar to petroleum. However, it has not gone through the "oil window" of heat (nature's way of producing oil) and therefore, to be changed into an oil-like substance, it must be heated to a high temperature. By this process the organic material is converted into a liquid, which must be further processed to produce an oil which is said to be better than the lowest grade of oil produced from conventional oil deposits, but of lower quality than the upper grades of conventional oil Perhaps oil shale will eventually find a place in the world economy, but the energy demands of blasting, transport, crushing, heating and adding hydrogen, together with the safe disposal of huge quantities of waste material, are large.* < *www.worldenergy.org/wec-geis/* global/downloads>

At present, shale oil is not being produced in the US, and large-scale commercial production was not expected for 20 to 30 years until recently when the price of crude tripled . But it's not for a lack of reserves and eastern US oil shales also contain notable quantities of metals, including uranium, vanadium, molybdenum, and others which could add significant by-product value. In November 2004 the U.S. government said it was ready to resurrect oil shale drilling in the Rocky Mountains, a technology heralded 30 years ago to boost America's energy output until it failed financially. I t also failed in Queens land in 2003, so it seems likely that

on a small scale, and with good geological and other favourable conditions, such as water supply, oil shale may make a modest contribution. within a few years but it cannot replace declining conventional oil production, without air and water pollution, huge shale tailing dumps and a large increase in greenhouse gas emissions.

The problem with sequestering CO2 emissions

Sequestering CO2 emissions from coal fired power stations into dying oil fields that are well passed their production peak and have a large proportion of heavy oil remaining that gets more and more difficult to remove. The assumption is that this would dispose of the CO2 and make the thick gooey crude (often full on impurities) less viscous and free flowing thus enabling more oil to be extracted. I don't know how feasible that is, but the environment movement should be looking at this potential means for extracting more oil which can be sold to reduce the cost of sequestration. If the volume of oil that can be go out is large enough then there is more chance of a sequestration program going ahead.

For example sequestration of CO2 from Hazelwood Brown coal Power station into dying oil fields via the exiting pipework infrastructure that links the nearby Bass Straight oil rigs to the mainland oil distribution facility is a better option than what we are doing now. Whether or not sequestration would be less costly with an upgrade of the generating facilities would require a feasibility study.

Their are technical problems with sequestration but m ore formidable are the political problems due to the privatisation of the brown coal power station. The Allen Consulting Group did a study for the Victorian Department of Infrastructure (DOI 2004) "Greenhouse Challenge for Energy" in which they looked at the costs of achieving various levels of reduced emissions through incentives like carbon trading.. They give figures of $40/tonne for the cost of geosequestration, and $50/tonne for the price of carbon required to make it worth replacing old inefficient power stations with new ones. Clearly, unless the emission of carbon dioxide into the atmosphere actually cost something, power station operators have no incentive to reduce them. However, if new studies show that sequestration of CO2 in oil fields enhances the volume of oil extracted the by 2008 when the "inflation adjusted" real price of crude oil is around US $105 a barrel that sequestration will have much better cost /benefit ratio.

The problems with the extraction and processing of Methane Hydrates

Methane Hydrates remain a most unusual energy source as the box on the next page with an article from the Guardian Newspaper in the UK shows. Indeed we know very little about Methane Hydrates as an energy resource and even less the extent of the environmental damage that could be produced. While deep sea research suggests that Methane Hydrates are plentiful, there is also evidence to suggest that significant concentrations are rare.

US IN RACE TO UNLOCK NEW ENERGY SOURCE (Methane Hydrates) David

Adam, science correspondent The Guardian Monday April 4, 2005

More than a mile below the choppy Gulf of Mexico waters lies a vast, untapped source of energy. Locked in mysterious crystals, the sediment beneath the seabed holds enough natural gas to fuel America's energy-guzzling society for decades, or to bring about sufficient climate change to melt the planet's glaciers and cause catastrophic flooding, depending on whom you talk to. No prizes for guessing the US government's preferred line. This week it will dispatch a drilling vessel to the region, on a mission to bring this virtually inexhaustible new supply of fossil fuel to power stations within a decade. The ship will hunt for methane hydrates, a weird combination of gas and water produced in the crushing pressures deep within the earth - literally, ice that burns.

The stakes could not be higher: scientists reckon there could be more valuable carbon fuel stored in the vast methane hydrate deposits scattered under the world's seabed and Arctic permafrost than in all of the known reserves of coal, oil and gas put together. "The amount of energy there is just too big to ignore," said Bahman Tohidi, head of the centre for gas hydrate research at Heriot Watt University in Edinburgh. "It's not easy, but it's not something we can say we can't do so let's forget about it." Britain may miss out on any future methane hydrate boom - the North Sea is too shallow and no deposits have been found in the deeper waters further north - but other countries have recognised their potential. Japan, India and Korea. as The United States, are investing millions of pounds in hydrate research.Ray Boswell, who heads the hydrate programme at the US department of energy's national energy technology laboratory, said the US was determined to be the first to mine the resource. "Commercially viable production is definitely realistic within a decade. The world is investing in hydrates, and one reason for us to do this is to maintain our leadership position in this emerging technology."

Its new project will see the drilling vessel Uncle John spend about a month in the Gulf of Mexico, where it will bore down to two of the largest expected methane hydrate deposits in the region. Scientists on the ship will collect samples for experiments to see how the methane might be freed and transported to the surface. This is harder than it sounds. In some deposits the crystals occur in thick layers, in others they are found as smaller nuggets. Puncture one hydrate reservoir and the giant release of gas can disrupt drilling, pierce another and getting the methane out is like sucking porridge through a straw. This unpredictable nature means energy companies traditionally view hydrates as a nuisance. This gives them a joint interest with the US government as both sides want to know where the crystals are - one to avoid them and the other to exploit them. Mr Boswell said: "We have a marriage of near-term industry interests and longer-term government interests. If they develop the ability to detect hydrates for the purpose of avoiding them, that's useful for people who want to do the exact same thing for the purpose of finding them."

Devinder Mahajan, a chemist at the US department of energy's laboratory in Brookhaven, is looking for ways to encourage subsea hydrate deposits to release their methane. He has developed a pressurised tank that allows scientists to study hydrate formation. "You fill the vessel with water and sediment, put in methane gas and cool it down under high pressure. After a few hours, the hydrates form, you can actually see it. They look like ice, but they're not," he said. "This is a very important issue, tied to our future national energy security." Hydrates on land are easier to get at, and in 2003 a team of oil companies and scientists from Canada, Japan, India, Germany and the US showed it was possible to produce methane from the icy deposits below Canada's Northwest Territories. BP and the US government are carrying out similar experiments in Alaska.

While deep sea research suggests that Methane Hydrates are plentiful, there is also evidence to suggest that significant concentrations are rare. Beyond that, they require a sophisticated technology to extract. The energy return on the energy invested to extract methane hydrates on a large scale would be very low and at present, it requires far .more energy to extract it and

process it , than would be obtained by burning it as a fuel. However, its too early to pass judgement on what may be achievable after ten years of intensive research and development except to say that world convention oil production will have certainly peaked by then

Another problem is methane leakage into the atmosphere. As a greenhouse gas, atmospheric methane has ten times the effect of carbon dioxide. There is also a rather remote possibility of disturbing ocean floor methane to the point that it comes out of suspension and is released in large quantities into the atmosphere. Finally, there is the potential for ecological damage of the oceans themselves. (Masutani, 2005) Paul Johnston, a scientist in the Greenpeace laboratory at Exeter University, warned that disturbing hydrate deposits under the seabed was a risky strategy.

The brief has been self-censored by the Commission to make it as narrow as possible

This draft report is deficient because it fails to address the crucially important issues despite the very wide brief given to the Productivity Commission. The brief has been self-censored by the commission to make it as narrow as the brief given to the the Parer Energy Market Review and the National Framework for Energy Efficiency. The Productivity Commission's Draft Report states:

> "The core issue of this inquiry is the economic and environmental potential offered by energy efficiency improvements which are cost-effective for individual producers and consumers?." "Examination of measures that generate net public benefits despite not being privately cost effective, is beyond the scope of this inquiry." (inquiry terms of reference p xxii)

The Commission interprets this to mean energy efficiency improvements that have net benefits from the point of view of the person making the improvement (that is, the *private* benefits to that person outweigh the costs of making the improvement). By this means they justify their failure to even consider the true magnitude of conventional oil reserves, and the likely reduction in global oil production over the next 20 years.

The actual terms of reference require the Commission to comment on the economic and environmental costs and benefits of *such* cost-effective energy efficiency improvements. Yet the draft report states that it has not been asked to comment on Australia's policy response to climate change, and that such issues are beyond the scope of their inquiry.:

This rather narrow, bureaucratic interpretation, that excludes considering the following :

1. reduced availability of affordable convention oil far earlier than for other energy sources and the absolute priority that must be given to the more energy efficient use of oil, the substitutions of alternative sources of energy and oil conservation measures.

2. the limitations on the use of natural gas liquids or natural gas as a substitute for petrol.

3. the increasing energy cost of extracting oil from deep water or the polar regions, from heavy oil, from shale or from tar sands, even though these alternative sources of oil are much more costly to consumers and emit far more greenhouse gas emissions.

The Draft Report does not ask for or expect *creative* interpretations and makes it clear that they are not going to consider the broader strategic issues rather they choose to focus on "why isn't the market working - or is it ?." There would nothing wrong with that if the strategic importance and its energy efficient use was a primary focus but it is not.

Given the very wide brief it is clear that the Draft Report is an exercise in self censorship by a group of economic rationalists who do not want to consider the long term threat to Australian national security posed by the growth in oil dependence or the fact that past and current governments have failed to address the inefficient use of the oil resource. Particularly its future impact on world trade which has the potential to induce a depression in the major economies of the world and wreck Australias economy at the same time.

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