People for Ecologically Sustainable Transport

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The Risk Management of the Decline of Future Oil Supplies after Peak Oil:

submission to the Senate Select Committee on Fuel and Energy

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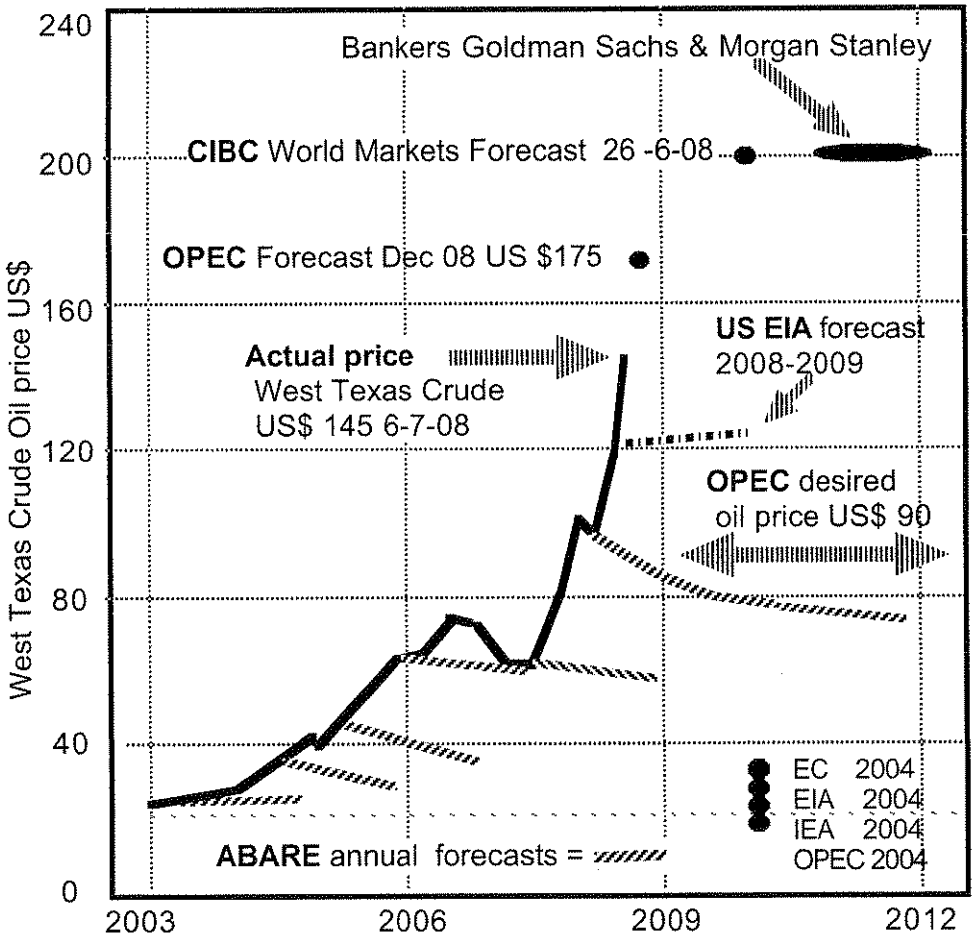
Figure 1. ABARE's recent oil price forecasts reflect 2004 forecasts of the IEA , US EIA, EU and OPEC until 2008



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Introduction

A failure to greatly reduce the demand for petrol and diesel fuel in the transport sector in the next five years is more likely than not to greatly increase the price of oil, induce chronic oil shortages and then economic chaos. There is a need to ration oil for essential uses as was done in World War 2 so as to avoid mass unemployment, food shortages and the collapse of the Australian economy.

Figure 1 (front cover) shows the inaccurate estimates of oil prices by Australian agencies ABARE , BTRE , the International Energy Agency and OPEC within the last five years. Figure 1 also shows forecasts in 2008 by leading US banks and financial consultants predicting that oil prices could increase to US$200 a barrel by 2010. Senior officers in the Commonwealth, Victorian and NSW state agencies completely failed to anticipate this growing problem. Indeed, the price of West Texas crude increased to US$147 in July 2008, more than five times the price of crude oil in 2003. (ABARE 2005)(BTRE 2005)(CIBC World Markets 2008) (Ward 2006)

In considering the evidence presented to the Select Committee it is crucial to establish why the key government agencies with a brief under the Westminster system *"to tell the truth to power "* did not know the truth, or withheld the truth or considered the truth to be a *"known unknown"*. Assuming that the truth falls in the last category it becomes obligatory for the Select Committee to take a risk management approach to the likely decline in future oil supplies after peak oil. This being so it is necessary to anticipate the worst case scenario: that a peak in the combined global production of conventional and non conventional crude oil could occur as early as 2012 with serious shortfalls in oil production within two or three years.

Another complicating factor is the impact of the increasing proportion of non-conventional oil being produced following the peak in the production of light and easy to extract conventional oil around 2007. There was growing recognition in 2007 and 2008 that producing oil from non-conventional sources results in a very large increase in greenhouse gases during the mining, processing and refining. This happens because of the poor energy return on energy invested in extracting and refining non-conventional oil that is produced from shale, tar sands, very heavy and sour oils or synthesising oil from coal or gas. This does not even rate a serious mention in past reports by ABARE and the BTRE. even though reports prepared by CSIRO are concerned about the decreasing returns expected on oil extracted to 2040.(Foran and Poldy 2002)

A supporting technical report (SKM 2008 A) prepared for a study conducted by Sir Rod Eddington for the Victorian government states that in 2020 future oil prices will be between US$35 and US$90 a barrel. That assumption is little more than unsupported speculation. This submission argues that the national and international energy agency sources, from which this 2020 price estimate are derived, are grossly inaccurate. It will be many months or even a year or two before more accurate data are available from the International Energy Agency (IEA) showing that the price of oil will be at least US$150 a barrel in 2020.

Furthermore Greenhouse Office and other Common wealth estimates of future carbon dioxide (CO2) emissions are all based on computer models that use low oil prices as their input to calculate high levels for future oil demand due to the increasing use of cars and trucks. These are all wrong as are all previous government agency estimates of CO2 emissions from transport because the only thing guaranteed to reduce CO2 emissions is mass unemployment, food shortages and the collapse of the Australian economy due to failure to conserve oil and ration it for essential purposes. The biggest impact will be in transport and average kms driven could perhaps fall by 50 % by 2012 and will perhaps fall much further than that by 2015. Indeed the

gap between growing world oil demand and declining world oil supply is not likely to be bridged and the indigenous production of oil is not likely to increase to compensate for reduced supplies of oil imports. This in turn will reduce the demand for electricity; bankrupt many industries wipe out banks and insurance companies and trash the superannuation of millions. When the Chinese economy backfires, because it has not enough oil and gas to keep it going, then the Australian mining companies will also be in recession.

Future oil cost estimates prior to July 2008 are completely unsound and render the estimates of future CO2 emissions invalid. The assumption that oil could be as low as US$35 a barrel 12 years from now is sheer fantasy.(SKM 2008 A) Failing to sensibly plan to reduce oil consumption will wreck the economy. Drastically reducing GDP and consumption levels will induce stagflation during 2010 and the GDP growth rate will drop to around 1% and then to zero. This of course will reduce oil dependency but in the most painful way possible for Australians. At first the people living in outer-urban and rural areas will be the most disadvantaged but within a year or so the well being of almost all people will be under threat.(Dodson and Sipe 2005)

It is argued that the Select Committee should take on board a risk management approach that assumes that frugality and the conservation of oil are both essential for the preservation of a democratic way of life. Several transport innovations are proposed to reduce oil dependence and the need for a strategic oil reserve. It is argued that there is a need for an international or regional oil depletion protocol to phase out oil dependence in a way that reduces the risk of resource wars or a world economic depression.

The unsound forecasts of the Australian Bureau of Agricultural and Resource Economics (ABARE)

ABARE is the Commonwealth agency with most responsibility for the failure of previous governments and consultants to anticipate and plan for the peak in world oil production; this peaking threatens the future economic well being of nearly all countries with escalating oil prices and the collapse of many industries dependent upon oil products and petrochemicals. Worst of all, ABARE has an oil addict's state of mind induced by gross dependence on oil which is best described by James Howard Kunstler:

We are now hobbled by a tragic psychology of previous investment – that is, having poured so much of our late-20th century wealth into this living arrangement – this Happy Motoring utopia – we can't imagine letting go of it, or substantially reforming it.

The ABARE spokesman on oil resources said at the 2007 Senate oil inquiry hearing that " *when the price is high enough even the roosters will lay eggs".* His little joke suggests that the spokesman knows about as much about biology as he does about petroleum geology. Perhaps he wanted to trivialise the threat to national security of peak oil which is second only to nuclear war and climate change. Whatever the reason the preservation of a stable democracy depends on conserving oil for essential purposes and ABARE has failed to anticipate this threat. Figure 1 on the front cover sets out the inaccurate oil price forecasts of ABARE since 2000 and poses the question that must be answered: how did they get it so wrong and why? The answer to that is given in the ASPO paper entitled: "The lack of reliability of ABARE's future oil price forecasts " (Ward 2006) which stated in the conclusion that :-

> *"ABARE's prediction pattern is generally the same: the oil price will gently recede from its current value. this means that in situations where the actual oil price is trending upwards it ABARE forecasts will tend to undershoot, and the further the forecasts goes into the future, the greater the gap will be. In short ABARE can predict the price under conditions where the price remains stable, because under such conditions the price will remain roughly constant or gradually recede. Unfortunately, stability (or lack there of) in the oil market appears to have been totally unpredictable, which ultimately renders it unreliable.*

ABARE's forecasts for 2005 were that the price of oil (West Texas Intermediate) would be between US$30 and $35 a barrel (ABARE 2005). Figure 1 shows that they are still making these totally useless forecasts 3 years later in 2008. As a pop song once said "when will they ever learn"

However ABARE is not the only Australian government agency whose forecasts of falling oil prices have been consistently wrong for five years. In particular the Bureau of Transport and Regional Economics (BTRE) was the Commonwealth agency responsible for misleading the the government, motoring organisations and state governments agencies and those responsible for the long term planning for public transport, cycling, green taxes and other measures to reduce oil dependence.

The unsound forecasts of the Bureau of Transport and Regional Economics

In 2005 the BTRE did a review of the peak oil debate entitled "Is the world running out of oil: working paper 61" which clearly shows that the BTRE did not have the intellectual resources to make its own forecasts and was dependent on the forecasts of international energy agencies(see page 23 table 4). It quoted oil price forecasts of these agencies all of whom were in denial that world oil production was nearly at a peak level and could no longer satisfy the increasing world demand for oil. The most powerful of these agencies was the International Energy Agency (IEA) which predicted that the price of oil in 2010 would be only US$22 a barrel, US$26 in 2020 and US$29 in 2030 . The US Department of Energy Information Agency 2010 forecast was US$23 a barrel and US$25 in 2020. The Organisation of Petroleum Exporting Countries (OPEC) which owns 77 percent of the world's proven oil reserves forecast for 2010 and 2020 was a trifling US$19 a barrel. By March 2008 these forecasts were way out.

The price of West Texas Crude was $US 145 a barrel on the 16th July of this year, an event which was not anticipated the Bureau of Transport and Regional Economics (BTRE 2005) which assumed that the price of oil in 2020 would be around $US 25 a barrel, based on the unsound forecasts of the International Energy Agency (IEA) and other prestigious overseas energy agencies (shown on Table 1). These unsound forecasts were also assumed to be true by the Productivity Commission and some government economists who did not know that the data used in these forecasts were mostly derived from the nationalised oil industries of dictatorial regimes. These national oil companies do not publish details about how much oil is extracted from each reservoir or what methods are used to extract that oil; nor do they permit external audits. (Economist 2006)

Table 1 Oil price forecasts for the period 2010, 2020 and 2030 (US $ per barrel)

Government or intergovernmental source	2010	2020	2030
International Energy Agency (IEA).	22	26	29
Energy Information Agency (EIA); US Department of Energy.	23	25	
European Commission (EC)	28	33	40
Organisation of Petroleum Exporting Countries (OPEC)	19	19	
Institute of Energy Economics Japan (IEEAJ)	24	27	
Centre for Global Energy Studies (GGES)	20	15	

Source: (BTRE 2005 working paper 61. p. 24).

The IEA admitted on May 22nd 2008 that it overestimated the capacity of oil-producing nations to open new fields to keep up with growing demand over the next decade. Global production, which the IEA previously reckoned could reach 116 million barrels a day by 2030, might not even make 100 million. Fatih Birol, the IEA's Chief Economist, said it was harder to keep supply and demand in equilibrium.

> *"When the price went up as a result of the Iranian revolution, demand went down,..... "But what has happened in the last few years has not been in line with economic theory. The price of oil went up sharply between 2004 and 2006 and demand actually increased. That may seem bizarre but it is the result of new buyers coming in, such as China and the Middle Eastern economies where fuel is subsidised by government and rises are not reflected on the consumer side."*

The Chief Economist at the IEA (Birol, F) now takes a more realistic approach to future oil prices, stating recently (The Independent, UK) that " the price of oil in 2030 will perhaps be US $150 a barrel" a mere US$ 121 more than the previous IEA estimate. He summarises the future problems faced by "Big oil" but still has an optimistic view of the price of oil in 2030.

> *We are on the brink of a new energy order. Over the next few decades, our reserves of oil will start to run out and it is imperative that governments in both producing and consuming nations prepare now for that time. We should not cling to crude down to the last drop – we should leave oil before it leaves us. That means new approaches must be found soon. Even now, we are seeing a shift in the balance of power away from publicly listed international oil companies. In areas such as the North Sea and the Gulf of Mexico, production is in decline. Mergers and acquisitions will allow "big oil" to replenish reserves for a while,and new technologies will let them stretch the lives of existing fields and dip into marginal and hard-to-reach pools. But this will not change the underlying problem. Oil production by public companies is reaching its peak. They will have to find new ways to conduct business.....What will all this mean for the price of petrol? The indications are that if the producers don't bring a lot of oil to the markets, we may see very high prices – perhaps oil at $150 a barrel by 2030. If the governments do not act quickly, the wheels may fall off even sooner. (Birol 2008)*

On June 10 2008 the US the US Department of Energy Information Agency forecast for 2008 was US$112 a barrel and US$129 in 2009; it will be some time before they update their long term forecasts. The 2009 forecast is US$ 106 more than their earlier forecast in table 1.(US EIA 2008)

Note that the Organisation of Petroleum Exporting Countries (OPEC) represents these national oil companies Its members are: Algeria, Angola, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela. OPEC's members own 77 percent of the world's proven oil reserves, or a total of more than 900 billion barrels. They account for about a third of the world's oil production and over 40 percent of global petroleum exports. OPEC's previous forecast for 2010 was a ridiculously low US $ 19 a barrel (see Table 1).

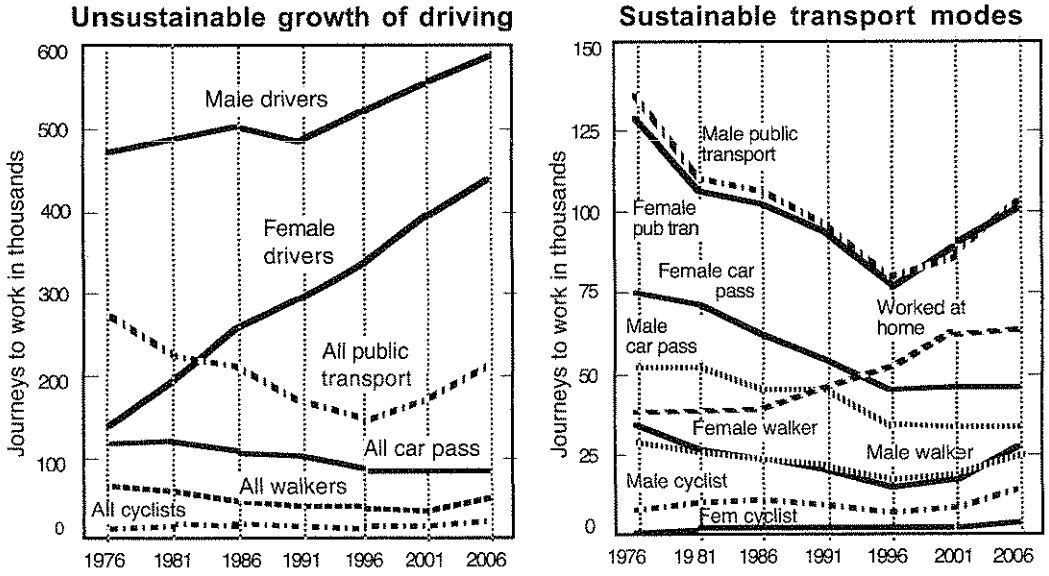
In April 2008 an OPEC spokesperson said *"There is no shortage; speculators are responsible for running the price of oil up."* That seemed to be the daily mantra at OPEC. In June 2008 at a conference of oil producers and consumers they even predicted oil prices to reach as high as $170 a barrel in 2008 (see Figure 1) However they were also concerned about the inflationary impact of high oil prices and said that oil at US$ 90 a barrel would suit them well. Saudi Arabia committed itself to a small increase in its production quota but that will not be sufficient to substantially change the price . OPEC stated that current high oil prices must come down but that the importing countries should establish regulatory controls to limit speculation on the oil markets and invest more in refineries so that the heavier and sour oil they could supply could be used.

Increasing the price of conventional oil makes it more economic to extract and process tar sands, oil shale and coal to make refined oils. These non-conventional oils have a much lower energy return on energy invested and increase CO2 emissions 3 to 7 times. (Parker 2007)

Because peak oil is certain to occur it would be prudent to conserve oil to maintain essential public services and food production. Building and installing the nuclear reactors, wind turbines etc. envisaged by the the British Prime Minister will also require a lot of oil and reserves will need to be retained for that purpose. Prudence dictates that the good oil has be conserved to build the infrastructure needed to survive the end of the age of oil. There is now no way that market forces can do that; national governments need take this role by acting together to avoid economic chaos. (Parker 2005A) (Parker 2007)

The business as usual scenario for oil use to 2030 will contribute to global warming

Australian commuters have been locked into a transport system that has become more oil dependent year by year and car commutes are still increasing as a percentage of all journeys to work and will increase the level of urban road congestion. Most urban transport plans assume that the travel habits of capital city dwellers will not change in the next 25 years and that the outer metropolitan regions will remain sprawling and car-dependent with very few of their residents using public transport. This assumption seems to be that the business as usual scenario for the development of Australia by giving priority to road building is acceptable even though it makes Australia more oil dependent and produces more CO2 emissions every year.

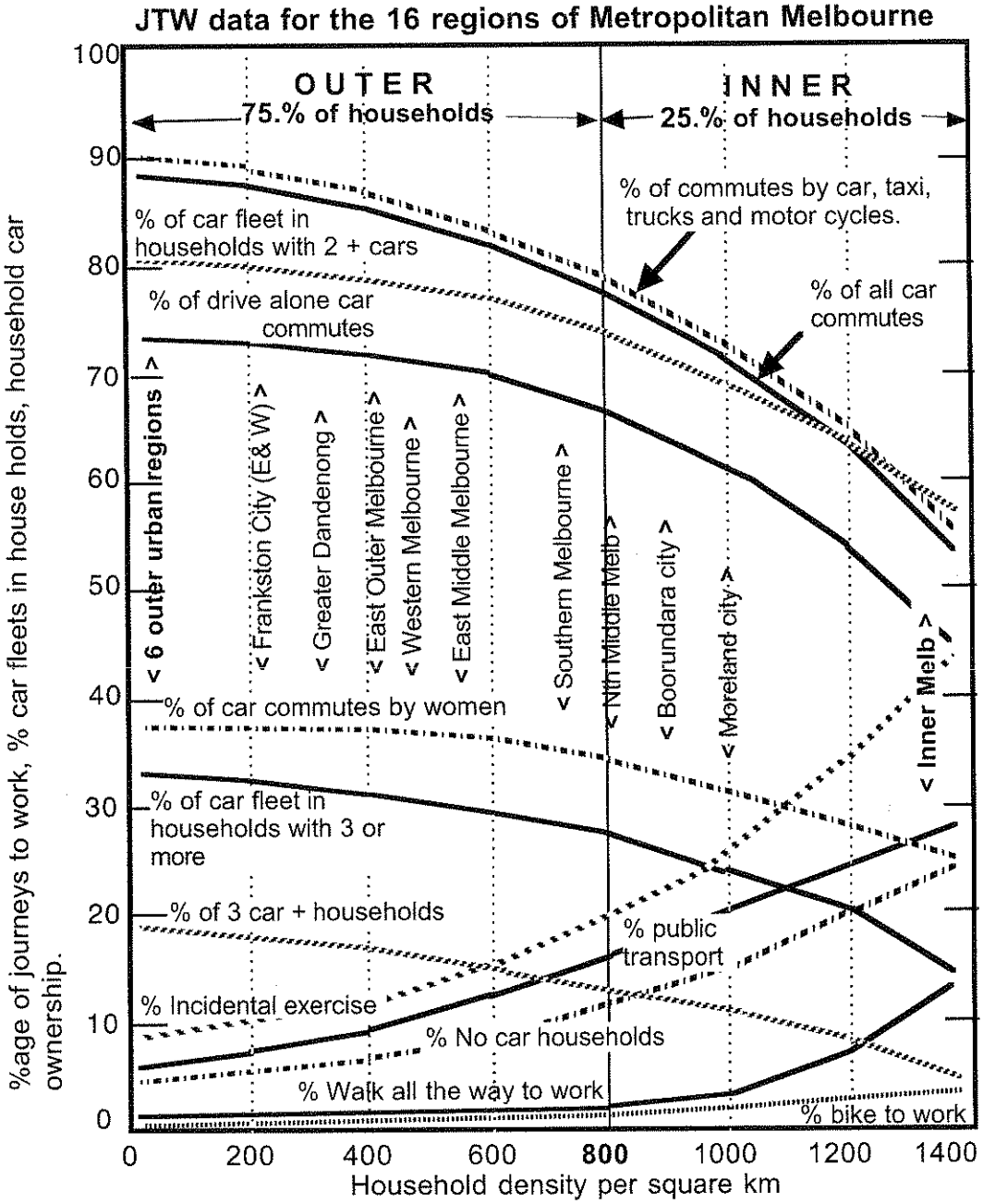


NOTES: The number of male and female drivers cyclists and walkers excludes multi modal journeys but public transport journeys includes multi-modal trips. Motorcycle, truck and taxi modes are omitted to clearly show the overall trend is for greater car dependency

Figure 2. Metropolitan Melbourne: journey to work 1976 to 2006

The data for Metropolitan Melbourne in the 2006 Census are used to illustrate the high level of car dependency particularly see figure 2. These data will vary from capital city to capital city. However the Melbourne data are typical in the sense that they show the car dependence of all the capital cities. The 2011 Census is unlikely to change the overall trends unless there are major oil shortages as there are no transport behavioural changes planned that can change the growing

level of car dependence.
As car journeys to work are responsible for 33% of weekday distance travelled on main roads in Melbourne and most car commutes take place in the rush hours with a high proportion of fuel wasting "stop/start" driving we can assume that increasing congestion costs are the most useful indicator of increasing household oil dependence and carbon dioxide emissions.



Notes. The %age of incidental exercise = The total % age of all public transport, cycling and walking journeys. The %age of drive alone car commutes = car driver commutes minus car pass commutes. Curves in outer regions have been statistically smoothed.

Figure 3 The dominance of single occupant car commutes and high car ownership levels in outer suburbia.

Data produced for the distance travelled by car commuters in metropolitan Melbourne provide us with a simple formula for indicating the high congestion costs and the growth in oil dependence generated by the 13% of all car trips used for the journey to work.

Car commutes in 2006 =
= 13% of all car trips
= 33% of distance travelled on main roads (Vic roads 2003)
= 40% or more of carbon emissions and congestion costs.

Most of the congestion creating commutes originate in the sprawling outer suburbs which have between 20 and 800 households per square kilometre and where 75% of the population now reside. In these areas 80% of households own 2 or more cars; around 85% of those who are employed commute by car and they are responsible for 85% of the distance travelled by all commuters and for 70% of the drive alone commutes in the metropolis. Furthermore, 78% of the car fleet resides in households with 2 or more cars. . Walking, cycling and public transport in 2006 only accounted for 13% of all commutes. The 2006 Census data confirm these trends.

Melbourne commutes were analysed in depth in 2006 for all the 16 regions of Melbourne with a focus on the inner/outer urban trends. Figure 3 shows the dominance of single occupant car commutes and high car ownership levels in outer suburbia. The percentage of walking, cycling and public transport commutes all decline with household density. (Parker 2004)

Figure 3 shows that when petrol is far less affordable those without access to public transport are likely to suffer considerable hardship because 90% of their journeys to work are made by car, truck or motorcycle and there is no easy way of continuing to do that without cheap oil. The greatest difference is between the Inner Melbourne Region, and the six outermost regions.

The Inner Melbourne Region has a density of 1,300 households per square km, commuting is far less car dependent and 43% of commuters benefit from "incidental exercise" incurred in walking, riding a bike or walking to and from public transport. As petrol becomes more expensive most households in this region will be able to dispense with their cars and survive without it as people did from the beginning of World War 2 to around 1950. However, Melbourne was a more compact city in 1950 and it certainly is not in 2007..

The need to greatly improve public transport in time to cope with future oil shortages is not even perceived as an important means of reducing emissions. Indeed the Commonwealth, unlike most other countries, denies it has a legitimate role in increasing public transport use and the same applies to the development of urban bikeway networks. There is no understanding that the primary purpose of new cycling infrastructure in outer suburbia should be to provide more convenient access to rail stations and express bus stops. Or to put it another way, bicycling to overcome the tyranny of distance in outer suburban sprawl. (Parker 2002)

Some really tough and unpopular measures will be needed soon. For example banning single occupant car trips for commuting and nonessential travel and eliminating perverse incentives by the provision of large company cars and salary packaged cars for those who do not need them for essential business purposes. Indeed, these unpopular measures will reduce oil consumption ten time faster than the time taken by the car industry to reduce the energy consumption of the national car fleet (Parker 2005 A) (Parker 2007)

In 2000 Australia's production of crude oil and condensate satisfied nearly 100% of its needs but by 2007 40% was being imported and this could be 80% by 2012. Australian oil production peaked in 2000 and will continue to decline for several years due to the long lead time from discovery to actual production.

The probability of finding more oil in or around Australia in a few years time to reverse the current decline in production is not good and is likely to reduce the energy return on energy invested and increase carbon dioxide emissions. (Parker 2007)

The Commonwealth does not recognise that becoming less self sufficient in oil has created a serious risk to the Australian economy and that the real need is to introduce green transport innovations. The fundamental geological and engineering constraints underlying the coming decline in world oil production and adverse impact on the climate were ignored by the Howard government. In 2007. The necessity to reduce carbon CO2 emissions gained popular support but there is still no appreciation that future oil shortages may reduce CO 2 emissions by collapsing the economy.The IEA recommendation for an Australian strategic oil reserve has been ignored.

The Rudd government recognises that planning to cope with climate change needs an "all of government "approach and bipartisan support but the need to confront the reality of the peaking of world oil production in the same way is not as yet on their radar.

The Review should accept that increased fuel prices can help drive technical change and alternative fuel use and that road congestion is desirable because it will induce demand for more public transport and reduce the demand for petrol and diesel fuel. The first step towards reducing CO2 emissions is to reduce oil dependence, because oil shortages will take place in the near future and this is the necessary first step to deal the much longer term risk to Australian national security of climate change.

Further evidence of the need for radical action comes from, the economist and climate change expert Sir Nicholas Stern who says:-

> *"he underestimated the threat from global warming in a major report 18 months ago when he compared the economic risk to the Great Depression of the 1930s. Latest climate science showed global emissions of planet-heating gases were rising faster and upsetting the climate more than previously thought"* (Reuters interview 17-4-08)

Evidence is growing that the planet's oceans - an important "sink" - are increasingly saturated and can not absorb as much as previously of the main greenhouse gas carbon dioxide (CO2). Methane emissions from the Arctic tundra are more dangerous than CO2 and are growing much faster than we had previously thought, so the absorptive capacity of the planet is less than we had thought, the risks of greenhouse gases are potentially bigger than more cautious estimates, and the climate is changing faster. The huge decline in the area of Arctic sea ice in September 2007 is an indicator that faster than previously predicted rise in sea levels is on its way.

Climate change is a long term threat to national security that is second only to a world war to gain control over finite resources generally and the remaining sources of clean and easy to extract sources of conventional oil. An Australian emissions trading scheme for reducing CO2 emissions needs to be reinforced with a "risk management approach' to future oil shortages by government, the car industry and consumers if CO2 emissions are to be reduced without the pain of an economic depression.

A risk management approach to the future is the only rational way to go

It would be prudent to take into account the current uncertainty and to consider the dangers of not risk managing oil dependence in the next ten years. There is now a scientific consensus that prudent and sensible risk management by governments of climate change must initially focus on reducing oil dependence because of the long lead times in reducing the oil used by motor vehicles. Reduced oil consumption in the next ten years will reduce CO2 emissions and conserve oil for food production and essential services.

Research shows that reducing oil dependence on both the supply and demand sides must be initiated more than 20 years in advance of oil peaking for a stable transition but peaking is likely to occur much earlier. Several future outcomes are possible. (Hirsch et al 2005) (Hirsch 2007)

- Oil production peaks then declines around 2010 inducing a world wide depression, wrecking the Australian economy, producing mass unemployment and famine in poor countries without oil resources.

- Oil peaks between 2015 and 2025 making a less painful adaptation possible; provided that most developed nations agree to reduce oil dependence with strong government, market intervention, the introduction of fuel rationing, fuel efficiency standards etc.

- Oil peaking after 2025 allows a timely adaptation with mutually agreed supply and demand side oil conservation measures recommended by the International Energy Agency .

A US study and recent Senate Inquiry into Future Oil Supplies recommended that government take a risk management approach to future oil shortages. However that has not been done so far.(Hirsch, Bezdek, and Wendling 2005)(Senate 2006) (US GAO 2007)

All national, state and local governments must redefine their long term planning strategies and restructure their transport bureaucracies so that they can reduce the demand for oil. There is a need for planners to include the worse case climate change and oil depletion scenarios in their long term plans.(Hirsch 2005)(Stern 2006)

Comments by the most experienced analysts and veteran geologists indicate that there is a serious risk of world crude oil production peaking between 2008 and 2012 which will increase imported crude oil prices, perhaps to $200 a barrel. This could cause permanent oil shortages and necessitate fuel rationing in most countries that are not self sufficient in oil, which includes Australia's major trading partners China, Japan, the US and India. This would result in a very large reduction in the export of Australian commodities and the import of diesel fuel refined in Asia to Australia.

Some analysts predict that increased prices of imported oil will blow the Chinese economy apart and make the Chinese economic model redundant, as distance from foreign markets and shortages of bunker oil impose a harsh tyranny. The Chinese dream of becoming the largest manufacturing nation in the world is based on the assumption that oil prices could be kept at a low level by price subsidies. Indeed China is already having to roll back subsidies for oil and electricity that have maintained high industrial and urban growth levels for many years and lifted nearly a billion people out of poverty as a consequence.(Hirst. D 2008)

For Australia and China there is a need is to reduce oil consumption by decoupling the growth in oil consumption from the growth of gross domestic product . Australia needs a crash program to reduce single-occupant car use, to increase the use of high-occupancy public transport, walking and cycling and needs many other measures to free Australia from oil dependence by 2020.

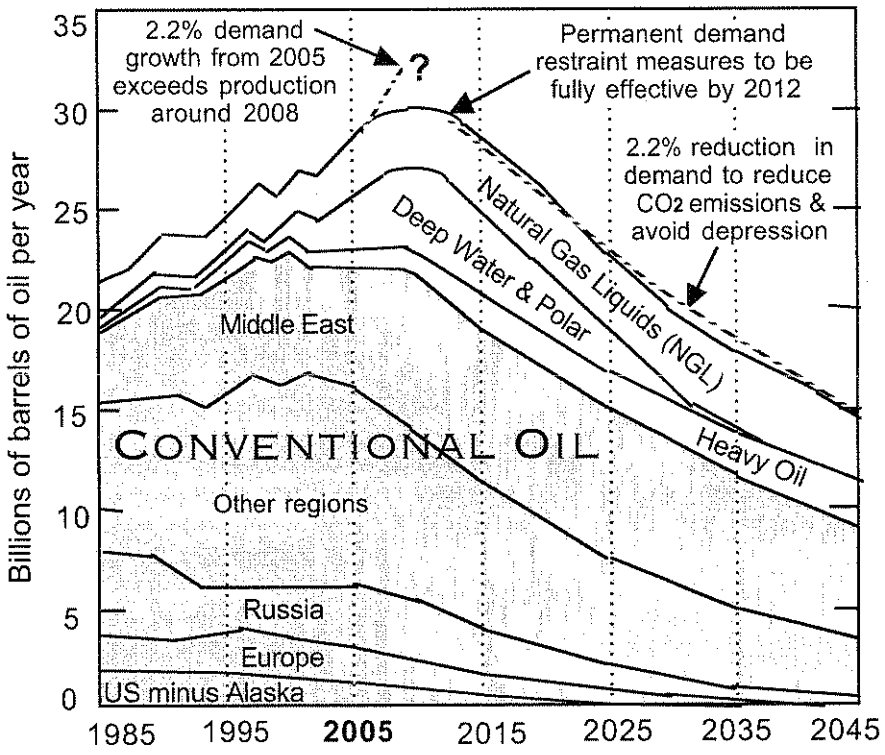
According to the latest CSIRO modelling of future fuel price. the worst case scenario for petrol is $8 per litre within a decade. The projections show that the drop in world crude oil production would lead to petrol prices between $2 and $8 per litre by 2018. Such a wide range indicates the need to take into account the worst case outcome. (Morton 2008) A major change is needed in the planning and management of the Australian transport sector which has one of the highest levels of per capita car and air travel, road freight carried, greenhouse gas emissions and oil consumption in the world.

Note that figure 4 uses data produced by the Association for the Study of Peak oil in 2005 in the

same year as the BTRE. published Table 1, the IEA and OPEC made their absurd forecasts of the price of oil in 2010 and 2030 shown in table 1. Note that the most recent ASPO data for 2007 is not significantly different and is far more accurate than anything produced by ABARE.

Figure 4 indicates the need to reduce world oil consumption by 2.2 % per year by decoupling the growth in oil consumption from the growth of GDP and persuading regional neighbours to do likewise. The risk of conventional oil (excluding carbon intensive non conventional oil) peaking between now and 2030 is certain and very likely to occur before 2020.

The worst case scenario is the significant risk of world conventional oil peaking before 2012. This cannot be ignored in long term planning because it would induce a world wide depression, wreck the Australian economy and produce mass unemployment for decades. Outer suburbanites and the poor in rural areas would initially be the most disadvantaged and a little later it would disadvantage everyone. It would be prudent for the Commonwealth and state governments to develop and implement a risk management strategy to mitigate oil dependence well before conventional oil production peaks.



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

Figure 4 The decline in conventional oil production from around 2010

Figure 4 shows world conventional oil production increasing by around 2.2% per year from 1985 to 2006 and then peaking between 2008 to 2012, followed by a 2.2% per annum decline in production to 2045 . That means that oil demand should be reduced to balance it with reduced oil production of 2.2% per year as follows:

- **2007 to 2008:** reduction of 715 million barrels a year,
- **2009 to 2020:** reduction of 660 million barrels a year,
- **2021 to 2030:** reduction of 616 million barrels a year,
- **2031 to 2040:** reduction of 515 million barrels a year,

Australian government economists and planning consultants do not appear to grasp the geological constraints or the geopolitical problems that are going to ensure that oil shortages are inevitable. The reality is that he easy to extract, light and sweet conventional oil is a finite resource that has already peaked or will peak do so in a year or so. They ignore the fact that after half of the oil in a reservoir is extracted the quality and quantity of the remaining extractable declines until all that is left is the viscous dregs, saturated with sulphur and or other pollutants.

They believe that by increasing the price of crude oil the market creates more of the good oil, when all it does is to increase the supply of sour and heavy oils. Increasing the price of conventional oil also makes makes it more economic to extract and process tar sands, oil shale and coal to make refined oils. These non-conventional oils have a much lower energy return on energy invested and increase CO2 emissions 3 to 7 times. (Parker 2007)

The modelling of the energy costs of conventional and non conventional oil in the long term in Australia by CSIRO confirms the the emissions of CO2 will increase per barrel of oil produced:

> *"the energy return on energy invested (EROEI)" in finding, extracting, transporting and refining oil will decrease. The reality is that the energy costs and benefits of oil extraction do change for the worse over time, as shown on Figure 1, and CSIRO scientists, recommend that physical energy profit accounting procedures should complement monetary accounting procedures for all important energy companies and national accounts .....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 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".* (Foran and Poldy 2002).

New data sources suggest a need to delay the date of reporting back by the Select Committee

There is a need to ignore simplistic predictions of Australian economic advisers that are not grounded in scientific fact. It is unfortunate that the most important oil conference that the Select Committee members should attend will start on the 21st of October which is the date given to the Select Committee for reporting back. This is the seventh International peak oil conference organised by ASPO at the World Trade Centre in Barcelona, Spain. More details are available on the official web page: http://www.aspo-spain.org/aspo7/homephp?idioma=en

The most important report published yet on world oil production and the level of world oil reserves the *"World Energy Outlook"* by the International Energy Agency is to be released in November. Representatives of the IEA will probably be available to brief ASPO conference delegates.

An earlier conference organised by ASPO-USA is to be held in Sacromento, California on September 21 to 23 and that would be worth attending. The conference has an impressive list speakers covering the full spectrum of subjects surrounding the peak oil issue.

A new publication *"An atlas of oil and gas depletion"* by C. J. Campbell , reviews the status of oil depletion in 65 countries, which are summed to give regional and world totals. The work provides a framework for analysis by the Select Committee. It is available for around US$ 200 from www.jeremymillspublishing.co.uk

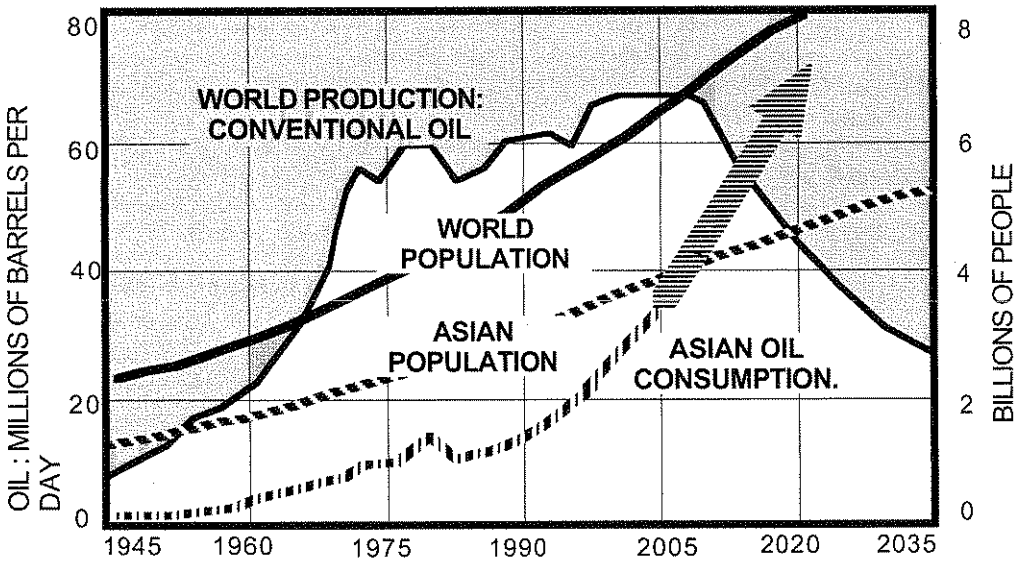
The Oil and Gas Journal also publishes what sounds like a comparable study by Rafael Sandrea costing US$4,500, entitled *"Future Oil and Gas Supply"*

An Oil Depletion Protocol: avoiding future wars over oil

To raise the awareness of the serious consequences to mankind of oil depletion the Association for the Study of Peak Oil (ASPO) has proposed the voluntary adoption of an Oil Depletion Protocol by all countries and all levels of government to reduce oil consumption each year by around 2.2% per year as early as possible.

Figure 5 shows the trends for both the growth in Asian population, the faster growth in Asian oil consumption and the peaking of conventional world oil production. Continued population growth and the faster growth of GDP in Asia have escalated the demand for oil and puts the oil needs of Asia on a collision course with the western world. Something has to give as it is not possible to feed the world without low cost oil supplies to power food production. What is happening is a political recipe for disaster. If wars over oil are to be avoided the largest oil consumers, the US, China, Japan, India, and Russia, must lay the foundations of peaceful and equitable use of the remaining low cost oil.

Figure 5 The growth in the Asian population, oil consumption and the peaking of conventional world oil production.



Source: PEST Alan Parker 2005

Both the US and the major oil importing countries are becoming more dependent on oil from the less stable parts of the world. That dependence must be reduced by peaceful means. What must never happen again is the destruction of oil infrastructure as happened in Iraq and Kuwait in 1990, and further infrastructure damage in Iraq in 2003, which reduced world oil production capacity. The Iraq invasion and occupation have cost the US$ 600 billion, over a million Iraqis have lost their lives, oil facilities are still being sabotaged and the war zone is now a training ground for terrorist insurgents who have the potential to destabilise other oil producing countries. An oil depletion protocol could help to avoid further conflict and reduce oil dependence.

Another problem that is being neglected is that the Middle East oil fields aged 50 years are now producing an increasing proportion of sour oil. US oil companies could not use this because of their failure to upgrade their refineries, creating supply problems for the USA in 2004 and 2005 and requiring the US to break into their strategic oil reserves.

The next US administration will hopefully exercise the kind of leadership that produced the Marshall Plan at the end of World War 2.(Simmons 2001) Hopefully the next administration will recognise that an oil depletion protocol is the way to initiate a global oil conservation and energy efficiency program coupled with the accelerated development of renewable energy resources before it is too late.

The purpose of the oil depletion protocol is defined by Heinberg as follows: -

> *'The Oil Depletion Protocol is a unique accord whereby nations would voluntarily reduce their oil production and imports by according to a consistent, sensible formulae. This would enable the task of energy transition to be planned and supported over the long term, providing a context of stable energy prices and peaceful co-operation. The protocol will be presented at international gatherings initiating the process of country by country negotiation and adoption, and mobilising public support'.*

The simplicity of the protocol is defined as follows:

> *'The protocol is so simple that its essence can be stated in a single sentence: signatory nations would agree to reduce their oil consumption gradually and uniformly to a simple formulae that works out at a little less than 3 % per year..... For both individuals and nations, transportation is the area of greatest dependence and vulnerability with regard to petroleum. It is also the area in which it is easiest to make measurable reductions in oil usage'. (Heinberg 2006)*

So far the Oil Depletion Protocol (ODP) has been explicitly endorsed by several cities, including San Francisco, California and Bloomington, Indiana. More significantly, perhaps, it has been implicitly adopted in the targets of the Portland, Oregon Peak Oil Task Force. The Peak Oil Task Force of Oakland, California will probably make similar recommendations. (Heinberg 2007)

It is recommended that the Oil Depletion Protocol (ODP) be endorsed by all Australian states and by the Commonwealth. The Select Committee should seriously consider this option. And endorse the finding of the previous Senate's Rural and Regional Affairs Committee in 2007 in its report of future oil supply problems and alternative transport fuels. It states that by far the quickest and most cost-effective means of responding to the long-term issues of peak oil and climate change is to make gains on the demand side.

The Committee made several important, recommendations: increase fuel efficiency of all new vehicles for major cities, adopt congestion charging, support use of rail for long distance freight and review fringe benefits taxation to reduce perverse incentives for car use. The most important recommendation stated that *"the essence of the peak oil problem is risk management"*.(Senate 2007)

The increase in the price of crude oil in the last 3 years and the confused response of the responsible agencies means that Australian governments need better information to decide a prudent response to the risk. The Senate recommendation reflects the uncertainty underlying policy a year ago. That uncertainty remains in August 2008. Whether or not the for need better information and a reduction in the level of uncertainty is resolved by the IEA *"World Energy Outlook"* published in November 2008 remains to be seen. What is clear is that the current review needs to have access to the IEA report recommendations before they report back to Parliament

If an oil depletion protocol cannot be negotiated in our region or the world Australia will need to insure itself against future conflicts over oil resources by creating a strategic reserve of oil to last at least six months. There is no other way of risk managing the potentially disastrous trends shown on figure 5.

INNOVATIVE TRANSPORT SOLUTIONS THAT INCREASE ENERGY EFFICIENCY.

Cheap energy policies have resulted in high rates of energy consumption and are increasing economic, social and environmental problems. People who are energy rich are becoming poor in other ways: high energy consumption impoverishes consumers, transfers wealth from Australia to foreign oil producers; exacerbates problems such as traffic congestion and accidents, and creates environmental risks such as climate change. To avoid these problems Australia needs innovative transport solutions that increase the economy's overall energy efficiency, that is, which extract more productivity and consumer welfare per joule of energy consumed.

Such solutions do exist , however the use of hydrogen as fuel to power capital cities car fleets is not a solution. Nearly all hydrogen produced today is made from natural gas and results in carbon emissions. The timetable laid out by the Bush Administration in its $1.2 billion "hydrogen economy" policy statements is not credible. The hydrogen economy is not the quick fix to oil depletion. On the contrary, a 2004 report from the US National Academies of Science concluded that, "under the best case scenario the hydrogen transition will do little to cut oil imports or greenhouse gas emissions during the next 25 years."

In rural areas hydrogen generated wind power could can be used to produce 'green' hydrogen by the electrolysis of water. This clean hydrogen could be used to power farm machinery and local trucks and buses but will never been made in sufficient quantity to power urban car fleets which will have to be reduced. There are also high costs and leakage of hydrogen due to its small molecular size in piped hydrogen distribution networks. Put hydrogen into the natural gas pipes that feed domestic users and there would be a huge increase in the leakage of hydrogen. However the use of hydrogen to power buses in the capital cities may be feasible.

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Reduced greenhouse gas emissions must be taken into account for both fuel consumption and the embodied fuel used and emissions involved in the manufacture of cars. If this is done then the following benefits of providing better public transport services and higher densities in the inner and middle suburbs. and providing incentive to use small cars are possible (Perkins and Hamnet 2005)

- Travelling fewer kms with less fuel consumption.
- Having more fuel efficient cars
- Having smaller cars requiring less energy to manufacture them.
- Having a lower household car ownership with far fewer households with 2 , 3, or 4 cars and requiring far less energy to manufacture cars per household.

The problem is that in the outer suburbs there are hardly any public transport services and what services there are do not go where people want to go, so reducing the proportion of households with 2, 3, or 4 cars is not a practical proposition. Lower density housing and poor pedestrian access ways make it very difficult for many people to access the limited public services by walking. Owning small cars is less acceptable because most work trips are far longer than in the inner suburbs.

What is needed is a package of transport innovations that reduce CO2 emissions and oil consumption by 60% in all suburbs In the following sections the innovations shown on figure 6, that are indicative only, are described in depth .

Figure 6 shows the need for petrol and diesel fuel efficiency standards the objective of which is to reduce the size and increase the fuel efficiency of the Australian vehicle fleet by making more energy efficient cars available. Encouraging people to share the existing and new car hire co-ops and to use them to access public transport is also important. Given the long lead time in planning and building rail lines the role of shared PMV's and car co-operatives should be considered as an extension to Travel Smart Programs in outer suburbia. It will take at least ten years to make the car fleet more efficient by replacing old fuel wasteful cars with new energy efficient cars so sharing PMV'sis a good way of reducing fuel consumption in the short term.

Depending on the severity of future oil shortages the fuel efficiency standards may need to be supplemented by replacing incentives to overuse cars such as in salary packaging schemes and replacing them with incentives to ride bicycles and use public transport. In the longer term the introduction of PMV's powered by compressed natural gas will be feasible and domestic recharging of the gas tanks.

Figure 6 also indicates the need to extend public transport services in outer suburbia; to provide safe and secure bicycle access routes and storage at rail stations, and express and trunk bus stops. The use of bicycles and electric bicycles has great potential. Given Australia's sunny climate the widespread use of electric bicycles with batteries charged by small solar cell arrays at home is feasible within ten years.

The adaptation measures on Figure 6 for transport mode shift and lifestyle changes can best be made at local government level by the promotion of Travel Smart programs supplemented by the provision of safe bicycle route networks that provide safe and secure access to public transport. These need to be applied in the outer suburbs of the capital cities where most long, single occupant car commutes originate.(See section 4.3 to 4.7 for details) The Commonwealth's role in the development of all these transport innovations is at the strategic planning level and in the provision of funding.

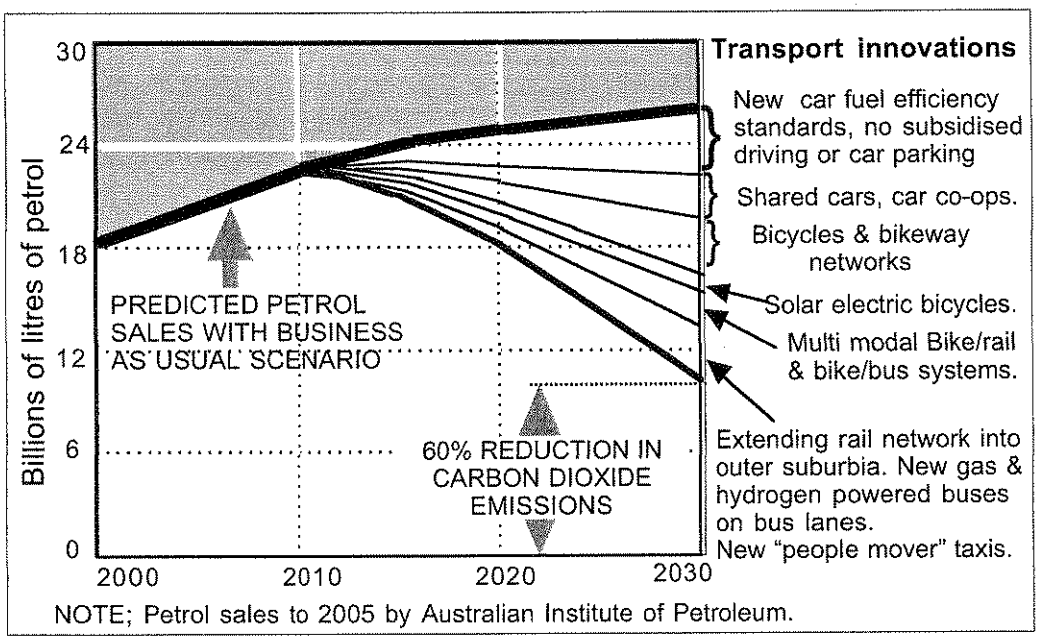

Figure 6 Transport innovations that reduce CO2 emissions by 60%

The poor energy efficiency of the Australian PMV fleet

Figure 7 shows how much more efficient cars are when transporting the number of passengers they were designed to carry. When the community decides that they must make better use of their PMVs by making fewer journeys but with more passengers that will reduce the level of multiple car ownership in households. Note that the solar electric bicycle is a zero emission vehicle.

In 2008 The greenhouse emissions per car sold in Australia were almost 50% higher than those sold in Europe — an average 231 grams of carbon dioxide a kilometre compared with 161 grams.

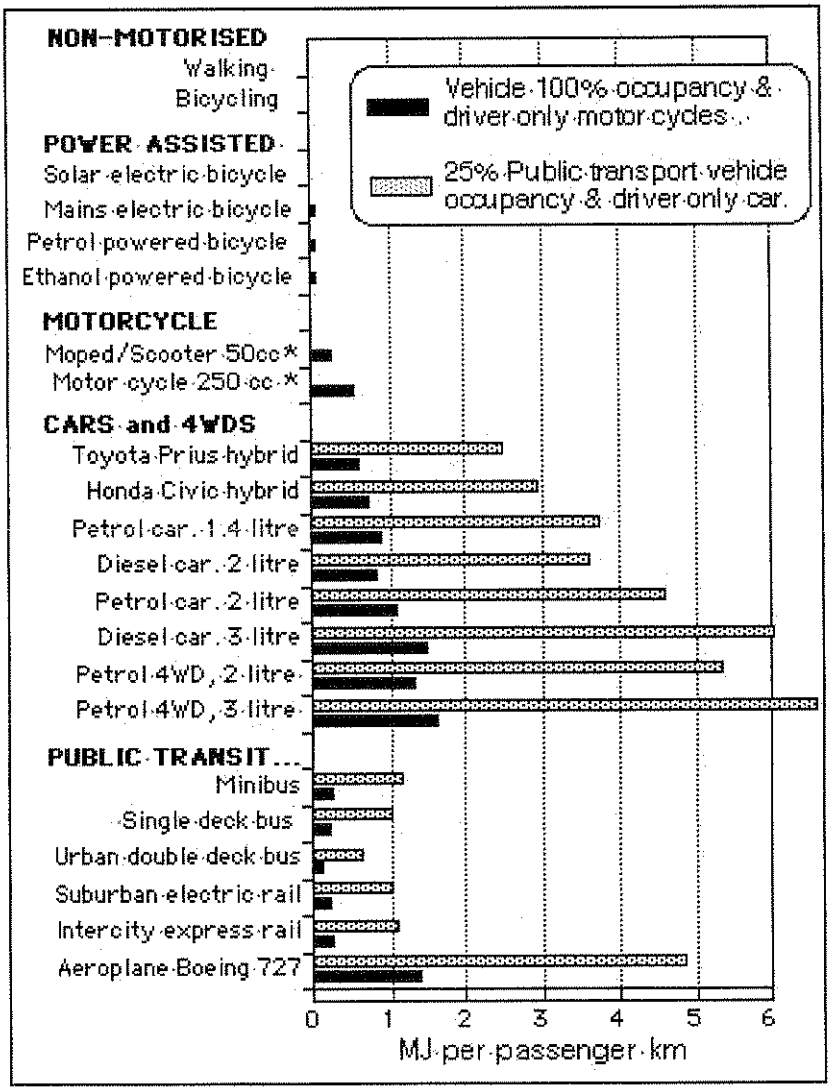

Figure 6 showing the efficiency of transport in terms of passenger km

Sources: Public transit: European commission 1992 "The impact of transport on the environment". Greenhouse Office Fuel Consumption Guide 2002-03,. Data on electric bicycles added by author in 2005.

More than half the new cars bought last year were part of government or business fleets. Despite dire climate change warnings made in the last decade only 13% of these PMV's were rated as low-emission vehicles. None of the low-emitters were Australian made; there are no locally produced vehicles meeting environmentally friendly criteria. In the long term government action could and should guarantee a secure market for more fuel efficient cars.

Fuel efficient PMVs will become more popular, helped by $500 million from the Federal Government to encourage manufacturers to produce them and petrol cost increases which are unavoidable as world oil production peaks and in a few years reduces.

Table 2 Vehicles sold in Australia with lower emissions only

MODEL	FUEL	CO2 EMISSIONS (G/KM)
Volkswagen BlueMotion Polo (not sold)		**99**
Peugeot and Citroen planned for 2011		100
Toyota Prius	petrol/electric	106
Toyota Prius I Tech	petrol/electric	106
Honda Civic Hybrid	petrol/electric	109
Audi A3 1.9e TDI Sportback	Manual diesel	119
Hyundai i30 1.6 Diesel	Manual diesel	125
Peugeot 308 XS HDi	Manual diesel	130
Peugeot 207 Touring XT HDi	Manual diesel	131
Mitsubishi Colt ES CVT	petrol	134
Skoda Roomster 1.9 TDI/77kW	Manual diesel	145
Skoda Octavia Elegance Wagon 2.0 TDI/103kW	Manual diesel	150
Renault Megane Sedan 6-Spd	Manual diesel	154
Audi A4 2.0 TDI Multitronic	(Automatic) diesel	154
Holden Astra CDTi Hatch	diesel	159
Hyundai i30 1.6 Diesel Auto	diesel	159
European Car fleet average		**161**
Skoda Octavia Ambiente Sedan 1.9 TDI/77kW	Manual diesel	162
Honda Civic VTiL Sedan	petrol	164
Volkswagen Golf 2.0 TDI Auto	diesel	165
Volkswagen Jetta 2.0 TDI Auto	diesel	168
Volkswagen Passat 2.0 TDI Auto	diesel	178
Saab 9-3 Vector 1.9TiD Sedan	diesel	181
Saab 9-3 Vector 1.9TiD Combi	diesel	181
Lexus GS 450h	petrol/electric	186
Audi TT Roadster 2.0 TFSI S-tronic	(Automatic) petrol	188
Peugeot 407 STHDi	Automatic diesel	189
Lexus RX 400h	petrol/electric	192
Mitsubishi Lancer ES CVT	petrol	196
Holden Captiva SX	diesel	198
Honda Accord Vti	petrol	209
Hyundai Santa Fe 2.2 Diesel	Autodiesel	218
Lexus LS 600hL	petrol/electric	219
Honda Odyssey Luxury	petrol	222
Australian car fleet Average		**231**

Automotive industry policy should be subservient to a national energy security policy that will guarantee that the depletion rate of indigenous oil supplies, the growth of oil imports and the growth in the use of large energy wasteful cars will all be significantly reduced. Sadly, energy wasteful Australian cars produced this year will still be on the roads ten years from now or scrapped prematurely because they will become too costly to run.

Government car purchasing policies should be changed to protect the Australian car industry by initially guaranteeing that government car fleets buy the Hybrid Camries that will be made in Altona. Until they are available no fleet replacement vehicles should be bought that emit more 150 gms of CO2 per km.

The fuel efficiency measure used today is of litres of fuel per 100 vehicle km, which is a good measure of engine efficiency but a misleading measure of the efficiency of the PMV fleet. The efficiency of public transport vehicles and PMV fleets should be measured in litres of fuel per 100 passenger km; High vehicle occupancy rates are necessary for public transport vehicles and this should also apply to PMV fleets. There is no reason at all why the average fuel consumption of PMV fleets should not be 2 litres or less per passenger 100 km and occupancy targets set for different classes of PMVs. The car industry needs a vision of future car use that will achieve a low level of fuel use per passenger km and it needs to support all measures to achieve that. The Australian car industry needs protected so that it can efficiently produce fewer but far more fuel efficient PMV's

Examples of political leadership in the production of energy efficient PMVs

An effective risk management measure to deal with this threat to Australian economic security is to have a dynamic car industry that makes small fuel efficient cars. Precedent for this comes from the USA , Japan and France in recent times. Sound and effective fuel efficiency standards were mandated in 2005 in the US due to the initiative of President Jimmy Carter and this could be done by 2009 in Australia. If hybrid petrol/electric, diesel/electric and gas/electric cars and LCVs are built in Australia then fuel economy improvements of 40% or more are possible (Bezdek and Wendling 2005). Increasing vehicle occupancy rates could increase that to 70% per passenger km. Similar reductions in fuel use will come from the use of compressed natural gas (CNG)

In the USA in September 1993 Vice President Al Gore signed an agreement with the big three car makers to produce cars that emitted less CO2. Collectively they committed their best efforts, with the help of government technologies and funding, to developing a fuel efficient "clean car" within a decade that would consume only 3 litres of petrol per 100 km. This agreement was called the Partnership for a New Generation of Vehicles and was aimed at creating a leapfrog mentality in Detroit. This happened because commercial intelligence advisors knew that car manufacturers in Europe and Japan would soon achieve these fuel efficiencies and that Detroit was dragging its feet.

Al Gore knew what was needed to reduce the risks to the US economy of future oil shortages. The big three signed up to this partnership but it was never put into practice. The wisdom of the author of "An Inconvenient Truth" is now evident in the latest research. (Bezdek and Wendling 2005) The huge loss of profits of the big three car manufacturers in 2007 means that they have had to lay off tens of thousands of car industry workers and at least one of the companies is likely to become bankrupt.

Australian vehicle fuel efficiency standards are needed that will ensure that by 2015 the average fuel consumption of the car fleet including 4WDs will be 5 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. If hybrid petrol/electric, diesel/electric and gas/electric cars and LCVs are built in Australia then fuel economy improvements of 40% or more are possible (Bezdek and Wendling 2005) .

The mass production of petrol electric hybrid cars by Toyota and Honda started with 70,000 petrol electric hybrids sold in the USA in 2004. Not only that, but a more efficient version of the small petrol engine for hybrid vehicle is being developed. Toyota is building hybrid PMVs in California and some other US States. Victorian and Commonwealth ministers, inspired by what Governor Arnold Schartzeneger's mission to Japan has achieved for California, have hopefully persuaded Toyota make these vehicles in Victoria.

French car makers Peugeot and Citroen have arranged to build a range of 1.0 litre, 3 cylinder engines to power their future passenger cars. Power outputs will range from 52 to 75 kW and will reduce CO2 emissions below 100 g/km. Their plans include 600,000 engines in France from 2011 and building another factory in Eastern Europe by 2012. (Age Drive 08) BMW is planning to introduce two litre diesel powered cars that emit only 128 g/kg of CO2. The Review needs to recommend incentives for people to buy these vehicles.

The power unit of the Lexus petrol electric/hybrid car, now on trial, will be used to power light commercial vehicles in the near future. Petrol/electric hybrid trucks are now being produced in Japan; they also need to be produced in Australia.

In the short term "greening" the tax system, so that small energy efficient cars are cheaper to buy and guzzlers are far more expensive and getting rid of the perverse incentive to overuse cars provided by salary packaging PMV's and the lower import duty on SUVs. "Greening" the tax system, can reduce Australia's reliance on fuels from the, mostly politically unstable, countries in the Middle East or Russia till around 2015 and reduce the demand for imported oil from non-conventional carbon intensive sources in the longer term. Many of the large cars produced today in Australia are exported to these politically unstable countries but that will probably cease when their oil production peaks.

The only alternative fuel for cars and trucks that is abundant in Australia is CNG

Australia natural gas reserves are estimated to be 4.000 billion cubic metres and oil companies in August 2008 gained approval to a $1.4 billion gas field in Bass Straight There is a need to utilise compressed natural gas (CNG) which is the only fuel suitable for cars and trucks that is abundant in Australia as well as emitting far less green house gas emissions and noxious air pollutants. An emissions target of 100 grams of CO2 per km - 40% reduction- is desirable by 2020. The use of ethanol as a fuel when made from food crops does not reduce CO2 and is unethical because it drives up the cost of food when there are critical shortages world wide.

Honda also produces a CNG powered Civic GX that is powered from a domestic CNG gas dispenser connected to the gas supply. A Honda Australia spokesman says that while their Californian car plant produced a Civic GX there was no available right hand drive version yet available. Apart from being cheaper to run and producing less pollutants the Californian Government provides rebates of US$5,000 to cover the cost of a home based fuelling system that can be mounted on a garage wall. Honda believes that the lack of infrastructure to supply CNG in Australia is the major constraint to the use of this cleaner fuel.

Larry Burns, General Motors Vice President, Research & Development. General Motors in the US said in July 2008 that

> *"GM is taking a serious look at natural gas in the O.S. as yet another way to diversify our portfolio of affordable and sustainable transportation energy solutions.... and that GM's experience and success with natural gas vehicles (NGVs) in Europe and elsewhere, could be put to use again in the US."*

The use of CNG powered buses was also in the News in July 2008. Venezuelan bus manufacturer ENCAVA has taken its first steps into natural gas bus production, with their first compressed natural gas (CNG) bus clocking up its first 20,000 km. Latamgas reports that demand for natural gas buses in Venezuela could be as high as 150,000 units in the coming years . The German bus manufacturer MAN Nutzfahrzeuge has landed two major natural gas bus sales with a value 'in the three-digit million euros'. The city of Ankara has ordered a further 500 MAN Lion's Classic natural-gas buses (CNG, Compressed Natural Gas) while 135 MAN Lion's City buses are headed for The Hague. The Review needs to recommend incentives for state governments to encourage the use of CNG powered buses.

The Australian automotive industry has the skill and the talent to ensure that petrol and diesel hybrid cars and plug-in electric cars can reduce CO2 emissions. It also has the skills to build efficient hybrid CNG/electric vehicles fuelled from domestic gas dispensers and petrol stations equipped to supply CNG. The Australian car industry must be protected so it can produce cars that can reduce CO2 in Australia. Producing a Toyota hybrid car in Altona is a welcome start in creating a more efficient car industry that measures its performance not by the number of cars it makes but by how it successfully exploits available resources to reduce CO 2 emissions. in passenger transport and freight movement in energy efficient light commercial vehicles.

The easy way to conserve oil is for a carbon tax to be levied at the point of sale on diesel, petrol LPG and CNG and to abolish the use of company cars for non essential purposes. A carbon tax is needed on the more carbon intensive substitutes for clean and sweet conventional oil. That will encourage the use of vehicles and machines that use less fuel and constrain the demand for fuel.

The Australian car industry and fuel distributors need to act co-operatively now to reorganise themselves. Chronic oil dependence will become critical when world oil production peaks in a few years time. The fuel distributors and car industry will go 'belly up' if oil for non essential uses is not rationed and if they fail to plan to produce fewer cars that are far more efficient and use the one fuel that will still be abundant in Australia which is CNG.

Bikeway networks in Melbourne and other capital cities have far too coarse a mesh

In the inner suburbs of the capital cities there is a partial network of bikeways that is supported by an extensive network of bus and heavy rail routes and some times tram or light rail vehicle routes. It will not be easy or cheap but it is feasible to complete this bikeway network and extend it into the middle suburbs and link it to rail and express because the middle suburbs are mostly well served by public transport. It is feasible to greatly reduce car use and oil consumption particular for the journey to work for those living in the inner and middle suburbs.

The proposed "principal bicycle network" in Melbourne is far too coarse, with too many breaks in the network and too few shortcuts to encourage bicycle use. It is also only 35% complete and not keeping up with urban growth. What is needed is a complete arterial bicycle network to provide short cuts for cyclists and pedestrians over and under freeways, railway lines, rivers and other barriers to motor vehicle travel. Main road bikeways on or alongside the roads, linked with traffic calmed local streets and off-road shared footways, are required. The mesh of the bike way network would be 500m x 500m in the inner areas and 750m x 750m in the outer areas, or the rectangular equivalent of these sizes. In Melbourne a bicycle arterial network would be around 7,500 km long, (Parker 2001)

The really difficult task is to greatly reduce car use and oil consumption particular for the journey to work for those living in the outer suburbs most of which are poorly served by public transport. This will require most transport infrastructure funding to be spent on extending the rail network and providing new cycling infrastructure in these outer suburbs which have spread out and are beyond walking distance of stations and express bus routes.

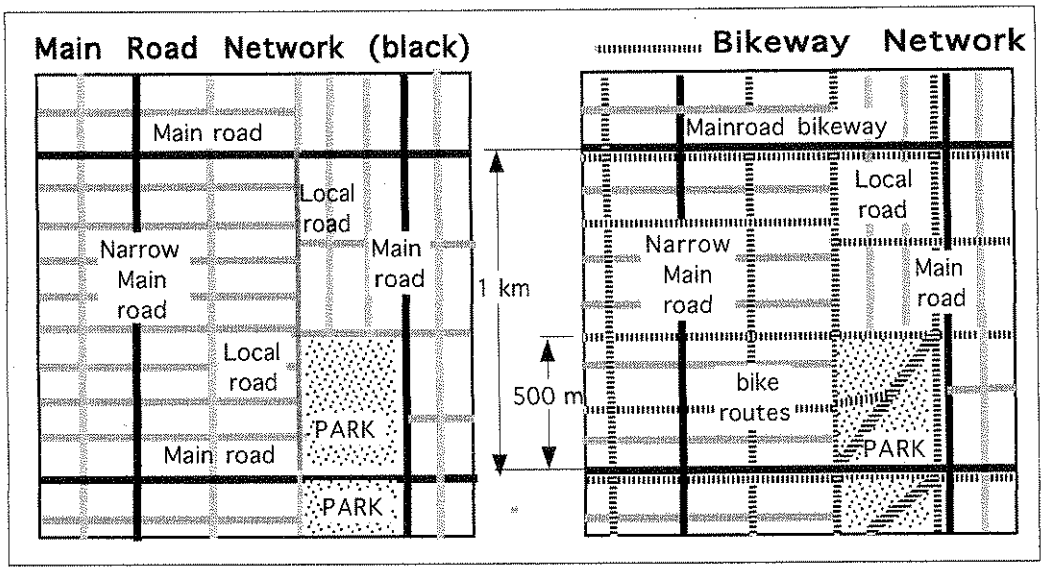

Figure 8 A Bicycle arterial network should be a recognised part of the "hierarchy of roads" with a finer mesh than the main road network
Source: BFA (2000 A& B)

Most one way streets for cars should be two way for bicycles and roads with bikelanes and should have a maximum speed limit of 50 kph. The introduction of a 50 kph limit on local roads in January 2002 in Victoria and the reduction of the legal leeway given to violators to 3 kph have made these roads safer for cycling and walking. It makes sense to use them to bypass sections of dangerous main roads. In the longer term a 40 km per limit on all residential streets is required as has been implemented in Unley in South Australia. On outer urban residential streets without a footpath for child cyclists to use there should a 30 km per hour speed limit as there is in many European cities.

The main constraints to increased bicycle use are institutional and changes need to be made to Commonwealth, state and road agency policies and practice. The competent provision of bicycle facilities and programs needs a bicycle/pedestrian planner in every LGA and the state and Commonwealth governments needs to recognise the labour intensity and importance of this task. Until that happens new graduates will avoid this kind of work; and will not take bicycle planning seriously as a career option.

In Victoria VicRoads has never had, or been required by the Transport Act to have, a staffed pedestrian/bicycle planning unit. Such a unit is needed with a budget of around $36 million a year for ten years to create a fine mesh bicycle arterial route network in Metropolitan Melbourne (Parker 2001A). Neither does VicRoads provide adequately for pedestrians and public transport users. The same applies to most other road agencies particularly the Road Traffic Authority of NSW

State governments are doing little to integrate bicycle access to public transport in the new outer urban areas which are so spread out that walking is not a convenient means of accessing rail stations or trunk bus routes.

The potential for bike/rail travel in Australian capital cities

The primary purpose of new cycling infrastructure in outer suburbia, which already have some off-road recreational cycling routes, should be to provide more convenient access to rail stations and express bus stops. When petrol rationing is introduced, as it inevitably will be, outer suburban households area going to need alternative means of transport and a bicycle network that connects with the existing rail stations and new rail stations and modal interchanges. Direct cross suburban rail linkages are going to be required for both passengers and freight. Using bicycles to access stations feeding the cross suburban CBD rail routes will be very important. (Parker 1996)(Parker 2002)

Without a good rail network and new express and trunk and local bus services land and house values will evaporate, adding to the pain of mass unemployment, bankrupt local governments and stagflation. Freeing up road space in this way will reduce congestion on outer suburban and inner and middle suburban areas for road freight transport and will also greatly reduce road freight fuel consumption. In this section we use Metropolitan Melbourne as an example. The conditions in other capital cities varies some are better and some are worse, but bicycle theft and vandalism is common to all of them.

In 2008 there are approximately 2.5 million (70%) Melbournians live within easy cycling distance (3 km) of a railway station. but only 430,000 (12%) live within easy walking distance. Of the 29,000 people who drive and park cars at rail stations around 40% to 45% drive less than 2 km, a very easy cycling distance. The average cost of a car parking space, taking into account the opportunity cost and the costs of drainage, is around $18,000 and twelve bike lockers could be made and installed for that price.

In Melbourne the potential for safe access to stations is good. Of the 190 stations, around 100 can be accessed safely by bicycle from quiet residential streets on one side or both sides of the rail lines and most of the other 90 stations can be safety accessed on main roads by experienced adult bike riders. There is a need for more rail stations in outer suburbia; these . will mostly be too far away to walk to, too time consuming to access by local bus, or not accessible at all by public transport. (Loder & Bayly 1987)

Bicycle theft and vandalism is a serious problem so it is important to provide more safe bike routes, more public transport and to provide secure thief and vandal proof storage for bicycles at rail stations and at express bus stops. If there was secure bicycle parking and if the rail system was extended into outer urban areas the potential of the the existing rail system in Melbourne would be extended by 50,000 bike rail commuters or more. (Loder & Bayly 1987)

The science of ergonomics provides hard data on the advantage of using bicycles instead of walking to go from A to B with the same expenditure of physical effort. Utilising the ergonomic advantage of pedalling over walking takes the average fit person 3.1 times as far in a straight line and the fit rider using a lightweight racing bicycle with high pressure tires 3.8 times as far. Pedalling instead of walking increases the theoretical catchment area of a railway station 12 times for an ordinary bicycle user and 19 times the areas using a racing bicycle. However there are several other factors that must be taken in account in determining the potential of bike rail to increase rail patronage. (Parker 2002)

See Table 3 below showing basic ergonomic data for bicycle and pedestrian access. The theoretical data, in this table have to be modified for each station because railway stations are not located in the middle of huge flat 'tar MacAdam' plains that are devoid of cars and truck traffic. Stations are located in the middle of areas with different street layouts, traffic control devices and other vehicles that delay cyclists and walkers. (Parker 2002)

Table 3 Station catchment area data for walking & cycling with the same physical effort of 75 watts for 7.6 minutes, within a rectangular street grid

	Walking	Mountain bike	Racing bike
Effort advantage	1	3.1	3.8
Speed km/hour	6.1	20	23
Distance km.	0.8	2.5	3
Catchment area sq km	1.3	12.4	19

In comparing walking and cycling to a station the cyclist also has to spend time to unlock his or her bicycle at home, and lock it at the station in a secure place which often requires travelling for up to 100 metres further than the walker. Sometimes shortcuts exist on the way to a station for the walker but the cyclist has to take a longer route to avoid breaking the law or avoiding dangerous traffic So the only accurate way to measure the overall advantage of getting to and from stations by bicycle is by laying out the cycling and walking routes to each station, for example in a grid iron street layout that could result in a smaller and rectangular catchment area. That detailed work has never been done for all metropolitan rail stations but it has been done for a few stations by this writer in Melbourne . In practice every bike/rail user knows that there is little advantage to be gained in riding less than 500 m to a rail station compared to walking. (Parker 2002)

As general rule the significant advantage of pedalling starts at around 1 km. On the rail system stations are mostly 1 to 3 km apart and cycling has the greatest potential for trips of 1 to 3 kms. It should be noted that most bike lockers are at the 59 premium stations of which around 40 are much further apart than stations in the inner suburbs. The potential market for bike/rail commuter cyclists in the outer suburbs that have a rail line, or can be provided with a rail line, is around 8 to 10 times more than for walking .

Dutch research has shown that bike/rail travel reduces the "time of leaving home to the time of boarding" and is less than for any other rail access mode. It is the only sustainable low cost option for significantly increasing rail patronage as a 1987 report for the Metropolitan Transit Authority clearly shows. (Loder & Bayly 1987) Boosting rail patronage by encouraging walking in low density suburbs is not the most viable option and access by local bus takes far more time from leaving home to actually boarding the train. For most outer suburbanites feeder buses to rail stations either do not exist or take a lot more time. (ECMT 2001)

Dutch research shows that if a bicycle is used at the destination station as well as the boarding station it so enlarges the rail catchment that very many more cross suburban trips are feasible and convenient for bike rail users. The idea that the rail system can only efficiently service the central business district only applies to commuters who walk to their final destination. However if a bicycle is used at both ends of a rail trip, as happens with 25% of the bike/rail commutes in the Netherlands, the rail system would not only provide convenient access to the CBD but to most destinations within easy cycling distance of rail lines. (Parker 2001)

The Netherlands is a model of world best practice in the integration of bicycles and the public transport system. Secure overnight bicycle storage is provided in bike lockers at minor stations or large bicycle storage areas for between 300 and 3,000 bicycles at the major modal interchanges and rail junctions. and 7,000 at Amsterdam Central Station. Only folded bicycles with smaller wheels, that take up little space, can be taken free of charge on 'with the flow' peak hour trains . Ticket inspectors on trains ensure that cyclists pay for their bikes; that is also appropriate for Melbourne. This also applies to Dutch provincial cities; good quality hire bicycles are available at the central city railway stations and bicycle repair facilities.(Parker 2001)

The problem in Australia is that we need interstate co-operation with experiments shared on the different rail systems. We need to get bike hire at tourist destinations and mass produced folding bikes sold by the rail authorities at cost to current "car park and ride' patrons and to cyclists who have never used the rail system before and currently commute by car. We need free bikes to be made available to rail patrons who park their cars or bikes at 'end of line' stations and who need a bike when they get to the premium stations in the inner and middle suburbs. This is happening in Europe but is not likely to happen here given the current mind set of senior transport bureaucrats.

Australians cannot buy the safest power assisted electric bicycle: the "Pedelec"

The Japanese power assisted bicycle industry invented a revolutionary, prototype of a pedal/electric hybrid bicycle in 1993. After several years of detailed design it evolved into numerous models of an energy efficient light electric bicycle weighing between 18 kg and 25 kg that are now being sold in over 30 countries but not in Australia. The electric power assistance is controlled automatically by a computer chip, like its four wheeled big brother the petrol/electric hybrid car. This hybrid two wheeler is known as a **Pedelec** and it is important to distinguish it from the throttle controlled **E-bike** which also comes in numerous models made in several countries which looks very similar to the Pedelec (Parker 2008).

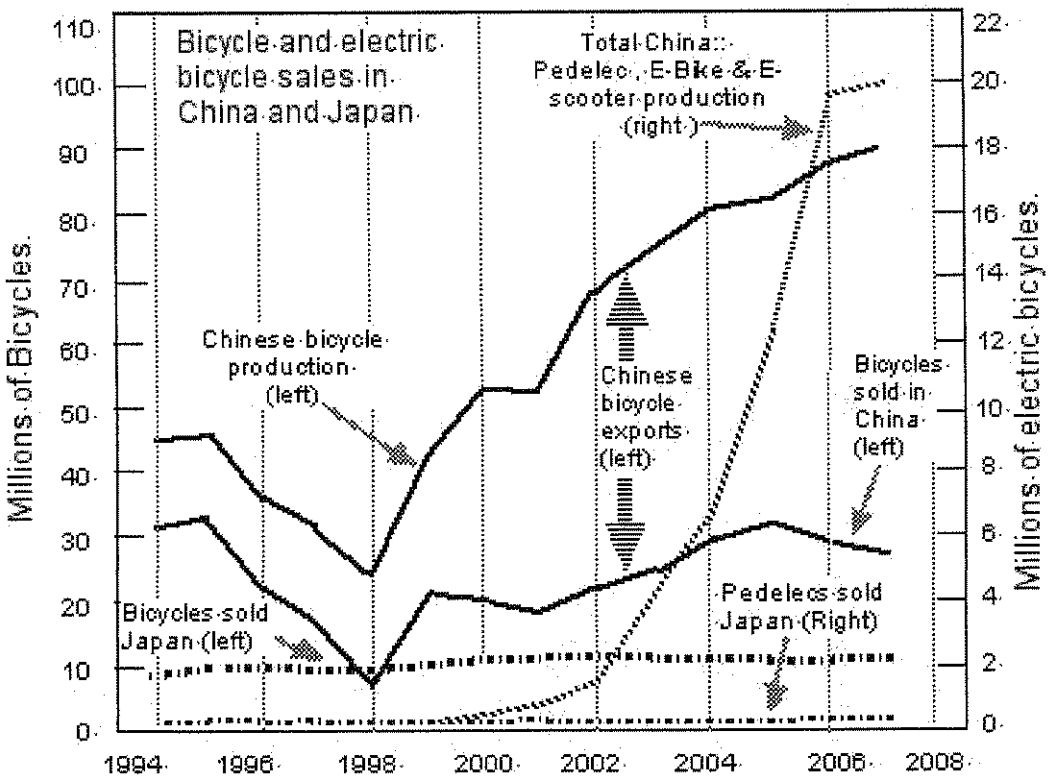

Figure 9 Bicycle and electric bicycle production in Japan and China
Data source Cycle Press (2008)

Both the Pedelecs and the better E-Bikes have similar riding characteristics to that of a geared bicycle but are a few kg heavier but halve the effort of cycling, particularly on hills. They are excellent for older people to make trips of up to 10 km and to access rail stations.

The Pedelec, was invented 9 years before the Australian road rules were published and in 2008 many transport regulators are still not aware of its existence even though millions of them have been produced. Pedelecs need to be legally classified as bicycles and not required to be registered, licensed or subject to compulsory insurance. See figure 9 for a 2007 model.

Figure 9 A typical Japanese "Pedelec" fitted with a small Ion Lithium batterymaximum power output 250 watts with automatic power assistance fading out 24 km per hour.

All that should be required is for importers to provide evidence to the regulatory agencies that their models of Pedelec have gone through the Japanese testing and approval process and comply with new battery safety standards when they are approved by Japanese Chinese and European regulators. This would enable Pedelecs and E-bikes to be used so as to reduce carbon emissions, air pollution and enhance the mobility of the elderly and the partially disabled. (Parker 2006)(Jamerson and Benjamin 2007)

Australian policy makers are wrestling with developing new road rules and regulations for electric bikes. They have little information about electric bikes, who uses them, why they are used, and what factors influence electric bike travel. They have no knowledge of the use of Pedelecs because they have not been imported due to obsolete Australian regulations which prevent the import of Pedelecs over over 200 watts from Australia's major trading partners, Japan and China. Over 300,000 Pedelecs will be sold in Japan in 2008 and 20 million E-bikes and mini electric scooters were manufactured in China. Sales data for electric bicycles and bicycles in Japan a China are shown of figure 5.

From a strategic transport planning perspective investing in bikeway networks would be more cost effective in Australian cities if they enabled bicycles and electric bicycles (E-Bikes) to be more safely used instead of cars (Parker 2006). Figure 6 shows that E-Bikes are very energy efficient using between one twentieth and one sixtieth of the energy used by cars per km. E-Bikes have great potential as access modes to public transport in the low-density areas of cities because they are designed to reduce the physical effort of pedalling by around 50%, so that elderly people will be able to cycle as easily as they did in their youth.

Those concerned with the twin threats of global warming and peak oil need to know that the next advance in the design of Pedelecs is on its way and will be a zero emission vehicle. Experimental Pedelecs charged from roof mounted solar cells and PV batteries can enhance mobility with minimum resource depletion. Surplus solar power can put electricity back into the grid.

In the near future these solar charged electric bikes will be mass produced in China and Japan. The opportunity now exists for Australian industry to develop roof mounted solar cells to charge the batteries of commercially available electric bikes.

Today the mains charged Pedelecs and E-bikes are potentially just as important as the various kinds of hybrid car in reducing carbon dioxide emissions and for reducing the growing dependence on imported crude oil that will probably increase to US$150 plus per barrel by 2009 (Parker 2007).

Australia needs both these hybrid vehicles and lots of them as quickly as possible. In a year or so the solar electric charged Pedelecs and E-bikes will have the potential to be the most important form of motor transport in cities to replace car trips of less than 10 km and to access public transport for longer trips. The Pedelec and E-bike will certainly be needed in outer suburbia when the oil crunch comes.(Parker 2006)(Parker 2008)

Conclusions and Recommendations

There is a significant risk of world oil peaking before 2010. This is the worst case scenario, which would induce a world wide depression, wreck the Australian economy and produce mass unemployment. Outer suburbanites and the poor in rural areas would be most disadvantaged. It would be prudent for the Commonwealth and state governments to develop and implement a risk management strategy to mitigate oil dependence well before conventional oil production peaks. The following measures need to be implemented as soon as possible and they are of relevance to the Select Committee Review -

- the Select committee to be briefed directly by the International Energy Agency about their recommendations for risk managing future oil production limitations in their November 2008 report *"World Energy Outlook"*.

- green the tax system to embody the costs of oil depletion into the price of diesel, petrol and aviation fuel and use the funds raise to decouple the growth in oil consumption from the growth of GDP, provide tax incentives and constraints reduce size of cars in the Australian car fleet.

- make better use of the car fleet by using CNG as a transitional fuel.

- establish a strategic reserve of a mix of crude oil and refined oil products.

- make better use of the car fleet by increasing in fuel efficiency by 50% by 2015; introducing car "fuel efficiency standards so that the average fuel consumption of the car fleet including most 4WDs be 5 litres/100 km and for the SUV and light truck fleet to be 6.5 litres/100 km. Promote and fund telecommuting, eco-driving, car sharing and car co-ops.

- the Commonwealth to produce a national Energy Security Policy to mitigate oil dependency with both demand and supply side measures and to unilaterally implement the proposed Oil Depletion Protocol by reducing oil consumption by 2.2 % per year. Make a commitment to freeing Australia from oil dependence by 2020 as is being done in Sweden and Norway.

- use the green taxes raised to build bikeway networks in all Australian cities, enhance rail infrastructure extend rail services and express bus services into all outer urban areas and provide secure bicycle parking at all modal interchanges and railway stations. Fund Travel Smart programs in all urban areas directed to reducing the number of multi car households. Promote and fund telecommuting, fuel conserving driving, car sharing and car co-ops.

- change current land use planning practice to eliminate urban sprawl and provide public transport services in new residential and industrial areas and make urban areas more permeable for walkers and cyclists.

- change the constitution of road planning agencies to make it their responsibility to reduce the; demand for road space, unsustainable travel, road congestion and the creation of a continuous arterial bike network within the overall hierarchy of roads. When there is room for bike lanes on main roads speed limits would be reduced to 50 kph. When there is not room for a bikelane or bike path in the road reserver a safe alternative route would be provided on residential streets. which should have 40 km pe hour speed limit.

- Provide more short cuts for and pedestrians and cyclists, that is more bridges and off road shortcuts thorugh both public and private properties, bridges over barriers, safe mid block main road crossings linking and better route signage and in central areas more roads that are one way for cars but are two way for pedestrians, cyclists, buses and trams. Plan to make it more convenient to go by bicycle than cars for trips of less than 5 km.

- Work with the Commonwealth's climate change and state environmental agencies to change the regulations to allow importing of electric bikes with power outputs of less than 300 watts and to encourage the use of electric bicycles with overnight battery charging. or charging from roof mounted solar photovoltaic cells.

By 2012 most of these measures should be implemented by state, Commonwealth and local governments working together to reduce greenhouse gas emissions and constrain the growth of oil dependence. Many of these measures will support radical and innovative changes in transport planning and the funding of transport infrastructure.

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