The Senate

Rural and Regional Affairs and Transport References Committee

Australia's future oil supply and alternative transport fuels

Interim report

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Chapter One

Introduction

1.1 The Senate referred the inquiry to the Committee on 29 November 2005. The terms of reference are:

> Australia's future oil supply and alternative transport fuels, with particular reference to:
>
> a) projections of oil production and demand in Australia and globally and the implications for availability and pricing of transport fuels in Australia;
>
> b) potential of new sources of oil and alternative transport fuels to meet a significant share of Australia's fuel demands, taking into account technological developments and environmental and economic costs;
>
> c) flow-on economic and social impacts in Australia from continuing rises in the price of transport fuel and potential reductions in oil supply; and
>
> d) options for reducing Australia's transport fuel demands.

1.2 The Committee advertised the inquiry in *The Australian* and wrote to many peak bodies inviting submissions. The Committee received 192 submissions and held 9 hearings. The Committee thanks submitters and witnesses for their contribution.

1.3 The inquiry was prompted by the question as to whether Australia should be concerned about 'peak oil'. This refers to the theory that, for fundamental geological reasons, global conventional oil production will reach a peak and then start an irreversible decline soon enough to be of concern. Proponents of 'peak oil' arguments commonly predict a peak somewhere between now and 2030. They suggest that this could cause serious economic hardship if mitigating action is not started soon enough.

1.4 There are additional concerns about recent rises in the price of oil and petroleum products, and concerns about the possible longer term effect on Australia as domestic demand increases and domestic Australian crude oil reserves decline (which is predicted).

1.5 The Senate committee system is scheduled to change on 11 September 2006. The Committee makes this interim report to record its thinking so far on the main points raised in evidence. The reference remains on foot and the Committee is due to report by 19 October.

Structure of the report

1.6 Chapter 2 summarises predictions of Australian and world oil production and consumption. It notes the arguments of the 'peak oil' proponents.

1.7 Chapter 3 describes the possible social and economic impacts of sustained high oil prices.

1.8 Chapter 4 discusses possible supply side responses to long term high oil prices. This mostly refers to promoting alternative fuels, including non-conventional oil.

1.9 Chapter 5 discusses possible demand side responses to long term high oil prices. The items most mentioned in evidence were encouraging more fuel efficient vehicles, encouraging more use of railways for long distance freight, and reducing the use of cars in cities.

Chapter Two

Future oil demand and supply

World oil production and consumption

2.1 According to BP's *Statistical Review of World Energy*, world oil production in 2005 was 81 million barrels per day (29.5 billion barrels per year), and proven oil reserves at the end of 2005 were 1,200 billion barrels. Year on year production grew in the OPEC countries and the Former Soviet Union, and declined in the OECD and other non-OPEC countries in total.[1]

2.2 On BP's figures oil reserves continue to grow: annual additions to reserves through new discoveries and reserve growth are greater than annual production ('peak oil' critiques of this statement are considered below).[2] 'Reserve growth' refers to the commonly observed increase in recoverable oil reserves in previously discovered fields over time. This results from 'a combination of several factors, including conservative initial estimates, improvements in exploration and drilling technology, improved production technology, and various political and economic forces'.[3]

2.3 This raises the question: why then have oil prices been high over the last two years? The usual answers are that demand has grown because of strong economic growth, particularly in China, while supply has lagged because of insufficient investment in new capacity since the period of low prices in the late 1990s. As well, commentators point to the weather in 2005, including hurricanes in the USA which disrupted production; and geopolitical instability, which has caused the market to want 'precautionary inventories'.[4]

2.4 In this scenario there is no fundamental geological constraint on the supply of oil, and prices may be expected to fall again in the medium term as higher prices stimulate exploration and investment, and supply catches up with demand. ABARE predicts that oil prices 'could remain relatively high for a number of years, but should fall towards the end of the decade 'in response to higher global oil production and a substantial increase in oil stocks by that time.'[5] It should be noted that ABARE's

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1 BP, *Statistical Review of World Energy*, 2006, p.6,8. 'Production includes crude oil, shale oil, oil sands and natural gas liquids.'

2 Year on year change in reserves is found by subtracting production and adding new discoveries and reserve growth. On BP's figures world oil reserves were 770 billion barrels in 1985, 1,027 billion barrels in 1995, 1,194 billion barrels in 2004 and 1,200 billion barrels in 2005.

3 T.R.Klett, D.L.Gautier & T.S. Ahlbrandt, 'An Evaluation of the US Geological Survey World Petroleum Assessment 2000', AAPG Bulletin, vol.89 no.8 August 2005, p.1036

4 For example, P. Davies (BP), *Quantifying Energy - BP Statistical Review of World Energy 2006,* speech 14 June 2006. International Energy Agency, *World Energy Outlook 2005*, p.5

5 ABARE, *Australian Commodities,* June 2006, p.303ff.

analysis was not supported by the overwhelming majority of submissions and witnesses.

2.5 Geopolitical factors also include the failure of the global market. Unlike other commodities, 80% of the world's oil is owned by countries, which are entering into long-term energy supply agreements that are in effect energy treaties. China has signed agreements with Iran and Venezuela for oil and Turkmenistan for gas. It should not be assumed that surplus energy will be available for purchase, even if countries like Australia and the US have the finance. As the Venezuelan president has said, 'These energy contracts are designed as a great wall against US hegemony.'

2.6 The International Energy Agency (IEA) predicts that in a 'reference scenario' world demand for oil will grow to 92 million barrels per day in 2010 and 115 million barrels per day in 2030. It argues that resources are adequate to meet the demand providing there is adequate investment; but it concedes that 'financing the required investments in non-OECD countries is one of the biggest challenges posed by our energy-supply projections.' [6]

2.7 The US Geological Survey in 2000 estimated that the world's total of conventional oil produced to date or with potential to be added to reserves by 2025 is about 3,000 billion barrels.[7] Of this total, in round figures about 1,000 billion barrels has already been produced.[8]

'Peak oil' critique of official predictions

2.8 Proponents of the 'peak oil' theory argue that official estimates of future oil supply are over-optimistic, and that supply will be constrained by lack of resources soon enough to be a concern. They include a number of prominent oil industry experts including oil industry veterans Colin Campbell and Jean Leherrere; Kenneth Deffeyes (formerly of Shell Oil and Princeton University); Ali Samsam Bakhtiari (formerly of Iranian National Oil Company); Matthew Simmons (leading energy industry financier and a former energy adviser to US Vice-President Dick Cheney), and Chris Skrebowski (editor, *Petroleum Review*).[9] Peak oil views are expressed by the Association for the Study of Peak Oil and Gas (ASPO) among other groups.

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6 International Energy Agency, *World Energy Outlook 2005*, p.45. The reference scenario assumes no policies to curb energy demand or greenhouse emissions beyond what governments have committed to already: p59.

7 US Geological Survey: *World Petroleum Survey 2000*, table AR-1. p.ES-1. This is the mean (P50) estimate: there is a 50% probability that the true figure is at least this much.

8 Conventional oil production to 2005: 968 billion barrels: Submission 10, ASPO Ireland, p.3. *Recoverable* oil should not be confused with the total resource, known as the Original Oil In Place (OOIP). The world's Original Oil In Place is a much larger figure; but on average world-wide only about a third of it can be recovered. This is because, as oil in a reservoir is extracted, it becomes gradually harder and eventually impossible to extract what it left.

9 Bureau of Transport and Regional Economics, *Is the world running out of oil - a review of the debate*, working paper 61, 2005, p.4.

2.9 'Peak oil' proponents commonly predict a peak of conventional oil production somewhere between now and 2030. Their concerns are based on the following observations or propositions:

- World discovery of oil peaked in the 1960s.[10] Production may be expected to mirror discovery after a time lag (as happened in the USA, where production in the lower 48 states peaked in 1970). Production in many major oil-producing countries is in decline.[11] The world is presently using more oil than it discovers.[12]
- Official estimates of world reserves, future reserve growth and future discoveries are over-optimistic, as follows:
- Reported reserves in the Middle East are untrustworthy. State owned oil companies do not release field by field figures to allow independent auditing. In many countries reported reserves were increased enormously for political reasons, absent any significant discoveries, during the 'quota wars' of the 1980s. In some countries reported reserves have been unchanged for years, suggesting that new discoveries and reserve growth exactly match production, which is implausible.[13]
- The US Geological Survey's 2000 report is 'thoroughly flawed.' Its estimate of future reserve growth (which it predicts will be almost as important as future discoveries) is unsound. The estimate was made by extrapolating US experience to the rest of the world. This is unsound because of the different conditions and because US reserve reporting is driven by US prudential standards which are not necessarily replicated elsewhere. As well, 'it failed to understand that reserve growth is mainly confined to large fields with several phases of development, and will not be matched in the smaller fields of the future.'[14]
- The USGS 2000 estimate of potential new discoveries, to be realised, would require a drastic turnaround of the historic decline in the rate of discovery. Discoveries in the study period to date have been far short of the suggested rate. 'This is doubly damning because the larger fields are found first.'[15]

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10 In relation to this, peak oil proponents quote remarks by Harry J. Longwell, Director and Executive Vice-President, Exxon Mobil, Houston, 7 May 2002. This appears to show annual oil discovery declining in an irregular fashion, but with a clear long term trend, from about 60 billion barrels in 1960 to 20 billion in 2000.

11 Submission 135, ASPO Australia, p.2

12 This contrasts with BP's figures showing continually increasing reserves. The explanation may be that the BP figures include reserve growth. Peak oil proponents argue that, when discussing the trend in discovery, additions by reserve growth should be backdated to the discovery of the field.

13 K.Aleklett & C.J.Campbell, *The Peak and Decline of World Oil and Gas Production*, n.d. p.6

14 K.Aleklett & C.J.Campbell, *The Peak and Decline of World Oil and Gas Production*, n.d. p.9.

15 K.Aleklett & C.J.Campbell, *The Peak and Decline of World Oil and Gas Production*, n.d. p.9.

2.10 ASPO suggests that the total past and future production of conventional oil will be about 1,850 billion barrels, of which about half (968 billion barrels) has already been produced.[16] This may be compared with the USGS 2000 mid-range estimate of about 3,000 billion barrels already discovered or with potential to be discovered by 2025.

2.11 There are large resources of non-conventional oil (such as Canadian tar sands and Venezuelan heavy oil).[17] However peak oil proponents argue that the difficulty, cost and environmental problems of exploiting them mean that they cannot make much difference to the scenario of future decline suggested by their figures for conventional oil.

2.12 Other commentators who reject peak oil concerns commonly argue (among other things) that pessimistic views of peak oil do not allow for the likely increase in oil exploration and technological advances in oil recovery which would be spurred by rising oil prices. However the Committee notes that the increasing costs associated with such recovery are such that there comes a point where the costs outweigh the benefits.

2.13 The US Energy Information Administration in 2004 estimated the peak of conventional oil for various scenarios of supply and demand growth, assuming a decline path after the peak which maintains a reserves to production ratio of 10 to 1. Most of the scenarios lead to a peak between 2025 and 2050. For example, using the USGS 2000 mid-range estimate of the recoverable resource, and assuming 2% annual growth in demand, leads to a peak in 2037. The outcome depends crucially on the assumed rate of demand growth, and by contrast is 'remarkably insensitive to the assumption of alternative resource base estimates…'

> For example, adding 900 billion barrels - more oil than had been produced at the time the estimates were made - to the mean USGS resource estimate in the 2 per cent growth case only delays the estimated production peak by 10 years.'[18]

2.14 The effect of these scenarios on long term oil prices is of course much harder to predict, as it also depends on other factors such as economic growth, the trend in energy consumption per unit of economic output, and the development of alternative fuels. ABARE's long term projections of demand for oil assume an oil price of $US40 per barrel, on the grounds that oil prices will be held to that level by competition from substitutes, such as oil from coal, which become viable at about that level.[19]

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16 ASPO Ireland, *Submission 10*, p.3

17 Estimated recoverable reserves are 315 billion barrels of tar sands in Canada and 270 billion barrels of heavy oil in Venezuela. ABARE, *Australian Commodities*, June 2006, p.305

18 J.H.Wood, G.R.Long & D.F.Morehouse, *Long Term World Oil Supply Scenarios - the future is neither as bleak or as rosy as some assert*, US Energy Information Administration, 2004, p.5-7.

19 ABARE, *Australian Commodities,* June 2006, p.303ff. Dr J. Penm (ABARE), *Proof Committee Hansard* 18 August 2006, p.59.

Comment

2.15 The Committee recognised that there is a convergence of concern about increasing atmospheric concentrations of greenhouse gases and declining global oil supplies. It was understood that solving the transport fuel challenge without reference to reducing greenhouse gas emissions would be a flawed response. The Committee determined to identify transport fuel solutions that were also consistent with the objective of reducing emissions.

2.16 Peak oil proponents have criticised official estimates of future oil supply with detailed and plausible arguments. The Committee is not aware of any official agency publications which attempt to rebut the peak oil arguments point by point in similar detail.

2.17 In the Committee's view the possibility of a peak of conventional oil production before 2030, even if it is no more than a possibility, should be a matter of concern. Exactly when it occurs (which is very uncertain) is not the important point. Australia should be planning for it now, as Sweden is doing with its plan to be oil free by 2020. [20]

2.18 In the Committee's view it is clear that gas will be the most significant transition fuel option for Australia, and as such a national reserve should be established.

2.19 Most official economic forecasts seem to regard the 'long term' as extending to 2030, and are silent about the future after then. In view of the enormous changes that will be needed to move to a future which is less dependent on conventional oil, the Committee regards this as inadequate. Longer term planning is needed.

2.20 The 2005 'Hirsch report' for the US Department of Energy argues that peak oil has the potential to cause dramatically higher oil prices and protracted economic hardship, and that this is a problem 'unlike any yet faced by modern industrial society.' It argues that timely, aggressive mitigation initiatives will be needed and that timing this is a 'classic risk management problem':

> Prudent risk management requires the planning and implementation of mitigation well before peaking. Early mitigation will almost certainly be less expensive that delayed mitigation.[21]

2.21 It should be noted that peak oil proponents do not claim that peak oil is the cause of present high oil prices. If the oil price declines in the next few years, as ABARE predicts, this does not dispose of peak oil concerns. Peak oil is a different and much longer term concern.

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20 Commission on Oil Independence [Sweden], *Making Sweden an Oil-Free Society*, June 2006.

21 R.L. Hirsch, R. Bezdek & R. Wendling, *Peaking of World Oil Production - impacts, mitigation and risk management.*2005, p.6-7.

Oil production and consumption in Australia

2.22 Commercial crude oil production in Australia started at Moonie in 1964, and grew dramatically after the discovery of the offshore Gippsland oilfields in the 1960s. It has mostly been between 400,000 and 500,000 barrels per day since then. As gas production has increased, production of associated condensate has also increased, to around 150,000 barrels per day.[22]

2.23 Future production depends on continued production from known reserves, additional production from known fields because of reserve growth, and predicted new discoveries.[23]

2.24 The rate of new discoveries has declined significantly since the discovery of the supergiant Gippsland fields in the late 1960s. More recent smaller discoveries have slowed but not reversed the overall decline in reserves as oil is produced.[24] Geoscience Australia predicts that Australian production of crude oil plus condensate will hold at current levels of about 550,000 barrels per day until about 2009 and decline thereafter to about 224,000 barrels per day by 2025, as reserve growth and new discoveries fail to match the rate of production.[25]

2.25 Australia's demand for petroleum (including crude oil and condensate) is over 750,000 barrels per day, and is projected to rise to over 800,000 barrels per day by 2009-10, and over 1,200,000 barrels per day by 2029-30 - an increase of almost 2% per year over the period.[26]

2.26 On Geoscience Australia's figures, it appears that over the next 20 years Australia's self-sufficiency in oil and petroleum products will decline from 84% to 20% (using a middle range estimate of future production), or from 98% to 31% (using an optimistic estimate of future production).[27]

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22 Geoscience Australia, *Submission 127*, p14,16. Condensate is a light oil-like liquid produced from gas fields. 1 barrel = 158.987 litres.

23 'Reserves': oil in known reservoirs which can be extracted commercially with today's prices and technology.

24 Dr C. Foster (Geoscience Australia), *Proof Committee Hansard* 12 May 2005, p.4.

25 Geoscience Australia, *Submission 127*, p.13. Midrange (50% probability) estimate. An optimistic (10% probability) estimate is for production of 342,000 barrels per day in 2025.

26 Geoscience Australia, *Submission 127*, based on ABARE, *Australian Energy - National and State Projections to 2029-30*, 2005, p.63

27 Geoscience Australia, *Submission 127*, tables 1 & 2. Taking the P50 and P10 production estimates in table 1 as a percentage of the oil equivalent consumption estimates in table 2. 'Middle range estimate' = P50 figures: there is a 50% probability that the true figure is at least this much. 'Optimistic estimate' = P10 figures: there is a 10% probability that the true figure is at least this much.

2.27 Geoscience's production estimates do not formally include future gains from reserve growth, enhanced oil recovery in fields nearing depletion, and undiscovered resources in basins which have not been explored or have no discoveries to date. These may be partly accounted for in the more optimistic estimate.

2.28 ABARE predicts that Australia's self-sufficiency in liquids fuel consumption will decline from 78% in 2003-04 to 49% in 2029-30. The large difference from Geoscience Australia's estimate seems to come from a higher estimate of future Australian production, based on an estimate of undiscovered resources by the US Geological Survey in 2000.[28]

2.29 In either case Australia's oil self-sufficiency is predicted to decline significantly. The predicted demand growth is a much more important cause that the variation of predictions about future Australian production.

2.30 The Australian Petroleum Production and Exploration Association (APPEA) notes that Australia has historically been a net exporter of oil, gas and petroleum products; however this situation has turned around in the last two years because of rising prices and a fall in domestic crude oil production. In 2005 imports exceeded exports by $4.7 million. APPEA suggests that by 2015 this figure could be in the range of $12 billion to $25 billion, depending on assumptions about Australian production and price.[29]

28 ABARE, *Australian Energy - national and state projections to 2029-30*, report 05.9, October 2005, p.45

29 Australian Petroleum Production and Exploration Association, *Submission 176*, p.8.

Chapter Three

Economic and social impact of high fuel prices

Introduction

3.1 Recent sharp rises in the price of oil have served to demonstrate that there are significant sectors within Australian society who have limited capacity to cope with sustained high oil prices.

3.2 Submissions and evidence to this inquiry on the effects of high fuel prices were mostly qualitative and anecdotal. There appears to have been little hard research on the effects to date or the likely longer term effects.

The effects of recent price increases

3.3 Reports show that the recent price increases in petrol have already affected the behaviour of some groups who have reportedly reduced unnecessary driving and non essential spending. Other responses also reported have included drivers moving away from larger cars to smaller cars and motor scooters becoming more popular.[1] Patronage of public transport has increased.[2]

3.4 A study by Dodson and Sipe of Griffith University has found that those Australians affected soonest and most severely are likely to be those most reliant on car transport, due to a lack of suitable alternatives. These people tend to be those in socioeconomically disadvantaged outer-suburban locations and those on the fringes of urban areas and in regional and remote communities.[3] [4]

3.5 Further analysis by Dodson and Sipe has found that household mortgages are also spatially differentiated, with higher debt burdens in the outer suburbs.[5] This compounds the impacts of higher fuel prices as these contribute to inflation and result in higher interest rates. The committee was told that bank repossession of homes has increased in recent years with rising fuel prices and interest rates. [6]

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1 Bell D., *Submission* 29, p.18

2 ABC Online High fuel costs boost commuter numbers 2/09/2005 retrieved from www.abc.net.au/news/newsitems/200509/s1451578.htm on 1/09/2006

3 ASPO – Australia, *Submission* 136, p.2

4 Dodson J and Sipe N *Submission* 165, attachment Dodson J and Sipe N 2005 Oil Vulnerability in the Australian City, p.23

5 Dodson J and Sipe N 2006 Shocking the Suburbs: Urban Location, Housing Debt and Oil Vulnerability in the Australian City, p.42

6 Bell D., *Submission* 29, p.19

Impacts on industry

3.6 A recent report for the US Department of Energy, the Hirsch report, notes that end use sectors that are able to switch to other fuels such as natural gas, coal and nuclear will do so but that in the transport sector there are no alternative sources that are able to compete economically.[7] The transport, mining, chemical, electricity generation and agricultural sectors have higher than average fuel utilisation and tend to experience significant first round effects. Construction and agriculture in particular are adversely affected by rising interest rates which tend to accompany rising fuel prices. Tourism is also adversely affected as high fuel costs reduce the amount of discretionary holiday motoring.[8]

3.7 Air transport is the most fuel intensive industry; hence it is expected to be the most adversely affected industry. Modelling of a permanent doubling in the world oil price, commissioned by the Queensland Government, projected air transport activity to be some 27% lower by 2016-17 than it would otherwise have been without increases in fuel price. Because increases in the price of oil are expected to result in depreciation of the Australian dollar, water transport activity is projected to be some 12% higher than the basecase level, because of its strong linkages with commodity exports.[9]

Impacts on agriculture

3.8 The Queensland Farmers Federation relied on ABARE data to illustrate the impact that rising fuel prices have had and are expected to have on agriculture. Farm costs are projected to rise 4.2% faster than farm gate prices in 2005/06 with farmers continuing to be price takers rather than price dictators.[10] They have little capacity to pass on increased fuel charges. Net farm incomes have been falling with fuel being the fastest growing cost input. Fuel costs in 2006 are double what they were eight years ago, while farm revenues have risen by just a quarter.[11]

3.9 The Queensland Farmers Federation told the committee of its concern that State and Federal Governments have failed to make the policy adjustments necessary to deal with the longer term implications of a permanent increase in fuel prices.[12]

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7 Hirsch RL, Bezdek R and Wendling R, 2005 *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*. p.25 quoting U.S. Department of Energy, Energy Information Administration. *International Energy Outlook, 2004*. April 2004.

8 PBB *Industry Risk Bulletin July 2005* retrieved from www.ppb.com.au/webdata/resources/files/IRB_Oil_National.pdf#search=%22Industry%20Risk%20Bulletin%20%22 on 01/09/2006

9 Queensland Government, *Submission* 155 attachments, p.18

10 Queensland Farmers Federation, *Submission* 120, p.3

11 Queensland Farmers Federation, *Submission* 120, p.4

12 Queensland Farmers Federation, *Submission* 120, p.6

Long term effects of a scenario of rising oil prices

3.10 A number of submissions raised concerns over expected impacts if the world is not prepared for peak oil. ASPO-Australia also claim that the economic and social impacts will be very serious unless we take the necessary precautions very soon.[13] The Hirsch report claims that only aggressive supply and demand side mitigation initiatives will allay the potential for peaking to result in dramatically higher oil prices, which would cause protracted economic hardship in the world.[14]

Macro economic impacts of rising oil prices

3.11 The Hirsch report noted that the world wide impact of increasing oil prices is expected to be a reduction in economic growth.

> Oil price increases transfer income from oil importing to oil exporting countries, and the net impact on world economic growth is negative.[15]

3.12 An ABARE study of the impact of rising fuel prices found that if oil prices were assumed to be 30 per cent higher, Australia's GNP [Gross National Product] would average an estimated 0.8 per cent lower than in the reference case at 2010. If oil prices were assumed to be 60 per cent higher than in the reference case, GNP was estimated to average 1.2 per cent lower than in the reference case at 2010.[16]

3.13 The Queensland Treasury's Office of Economic and Statistical Research has modelled a 100% increase in the price of oil and petroleum. The study found that with a permanent increase, the dominant macroeconomic feature was a decline in the terms of trade. This translated to a decline in real income for Queenslanders with a projected fall of 2.98% in real GSP [Gross State Product] by the second year of the simulation. In the long run they found real GSP was projected to recover somewhat, to a level 1.01% lower than it would otherwise have been.[17]

Impacts on Australia's Balance of Payments

3.14 The impact on Australia's balance of payments of a growing oil deficit was discussed by a number of witnesses. ABARE argued that as Australia is a net energy exporter, a rise in the cost of oil imports would be expected to be offset to a large

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13 ASPO- Australia, *Submission* 135, , p.1

14 Hirsch RL, Bezdek R and Wendling R, 2005 *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*, p.5

15 Hirsch RL, Bezdek R and Wendling R, 2005 *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*, p.27

16 ABARE, *Submission* 166, p.6

17 Queensland Government, *Submission* 155 attachments, p.16

degree by increasing prices and demand for Australia's energy exports, to the degree that there is some substitution between energy sources available.[18]

Inflation and interest rates and unemployment

3.15 Submissions raised the prospect of increasing oil prices impacting on inflation and hence interest rates. The Queensland Farmers Federation see higher interest rates causing most of the economic damage.[19] [20] The impact of demand destruction on increased unemployment was also raised.[21]

> Higher oil prices result in increased costs for the production of goods and services, as well as inflation, unemployment, reduced demand for products other than oil, and lower capital investment. Tax revenues decline and budget deficits increase, driving up interest rates. These effects will be greater the more abrupt and severe the oil price increase and will be exacerbated by the impact on consumer and business confidence.[22]

Reduction in globalisation

3.16 The Murdoch University Institute for Sustainability and Technology Policy expects global trade to continue in a post peak oil world, although the character of global trade is expected to change once the costs of this trade become expensive. Trade in future is likely to become more localised.[23]

The risk of supply side disruptions

3.17 Treasury in the 2006-07 budget papers noted that given the low level of spare capacity for oil production, there remained a risk of further supply side disruptions. In particular it was concerned about the potential for instability in key oil producing countries to have a more pronounced impact than the demand driven rises experienced to date.[24] Treasury noted that oil demand is unresponsive to price in the short run, and modest disruptions in world supply could raise oil prices very substantially, and for some time.[25]

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18 Fisher B. (ABARE), *Proof Committee Hansard* Canberra 12 May 2006, p.9

19 Queensland Farmers Federation, *Submission* 120, p.6

20 Hirsch RL, Bezdek R and Wendling R, 2005 *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*, p.32

21 Bell D, *Submission* 29, p.19

22 Hirsch RL, Bezdek R and Wendling R, 2005 *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*, p.28

23 Institute for Sustainability and Technology Policy, Murdoch University, *Submission* 11, p.13

24 Treasury, *2006-07 Budget paper no 1 statement 3 - The outlook for the international economy*

25 Treasury, *2006-07 Budget paper no 1 statement 4 – Australia in the world economy*

Avoiding adverse impacts

3.18 The Hirsch report argues that adverse impacts from peak oil could be avoided using existing technologies if given enough lead time.[26] ASPO-Australia argues that many adaptations are justifiable even without peak oil concerns.

> Certainly, preparing well in advance for Peak Oil is a very prudent strategy. Many of the possibilities are "No Regrets" options (those that are already justified on social, environmental, health or economic grounds).[27]

3.19 The Hirsch report argued that mitigation strategies would take 10 to 20 years to put in place.

Comment

3.20 The Committee notes that there are credible concerns that markets will not respond in time to provide a smooth transition to a post peak oil world without government action. Given the uncertainty about much of the information on world oil supplies and the geopolitical instability of the oil bearing regions, there may be a risk that markets will underinvest in oil and energy technologies, resulting in economic and social hardship as supply falls below demand.

3.21 The information required to make a clear determination on whether peak oil will occur before the market can provide mitigating action is not available. The following chapters discuss possible mitigation actions that can be applied that would allow a prudent approach to managing the possibility that peak oil will result in substantially higher oil prices and a constraint on liquid fuel availability.

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26 Hirsch RL, Bezdek R and Wendling R, 2005 *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*, p.66

27 ASPO- Australia, *Submission* 135, p.10

Chapter Four

Supply side responses

Overview

4.1 There are two main adaptive responses available for dealing with possible future restrictions on the availability of transport fuels and accompanying high prices that are likely, should supply fall significantly short of underlying demand because of peak oil or geopolitical factors. One is to reduce or manage demand so that available supplies can be used more economically and in a way that maximises the ability of society to function and minimises disruptions to the economy. Demand side responses are considered in Chapter 5. The other response is to find other methods of obtaining supplies – in other words, a supply side response. Both responses are likely to be necessary.

4.2 Demand side measures may make a significant contribution to easing the economic disruption of restricted fuel supplies and high prices, if these come to pass, but there are some parts of the economy where fuel demand management will inevitably be difficult, at least in the short to medium term. This country's economic well-being is currently dependent on primary industries, in particular mining and agriculture, which are very liquid fuel dependent. The transport industries, which are currently also liquid fuel dependent, are also vital to economic well-being. As noted in Chapter 2, the implications for the balance of trade on increasing oil imports are also expected to rise to in excess of $20 billion per annum by 2020.[1] Accordingly, it is prudent to actively explore both demand and supply side responses to a potential oil supply crisis.

4.3 The Committee has received evidence about a number of supply side options that are theoretically available. These include:

- finding more conventional oil supplies within Australia or in Australian territorial waters;
- sourcing a proportion of fuel requirements from biofuels such as ethanol or biodiesel;
- non-conventional petroleum, producing transport fuels by liquefying coal or natural gas, or producing it from oil shales, and
- fuel shifting, for example using LPG, natural gas or hydrogen as a transport fuel.

4.4 All of these possibilities come at a cost, economic or environmental, or have limitations. There is no universal panacea, no one perfect solution. This chapter gives a broad overview of the evidence received on each topic. The Committee has formed

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1 Robinson B,(APPEA), *Proof Committee Hansard* Canberra 11 August 2006, p.3

preliminary observations about each, but leaves in-depth analysis of each for the final report.

Searching for more oil in Australia

4.5 Australia has, for several decades, been self-sufficient in oil, thanks largely to the discovery of the large oil and gas fields in the Gippsland and Carnarvon basins. As described in Chapter 2, this self sufficiency is declining. The evidence received by the Committee indicates however that there is a view, particularly amongst organisations such as Geoscience Australia, that there are prospects for discovering new oil resources within Australia and in Australian territorial waters.

4.6 Geoscience Australia told the Committee that by world standards, Australian sedimentary basins, particularly those in offshore areas, have only been lightly explored. Fewer than 9,000 exploration and development wells have been drilled in Australia, compared to about 3,000,000 wells in the United States, which has a comparable land area.[2]

4.7 The Australian Bureau of Agricultural and Resource Economics (ABARE) gave similar evidence, stating that more than half of the offshore basins that show signs of petroleum potential remain unexplored.[3]

4.8 Exploration activity for new reserves in Australia is at close to all-time lows. Information provided by the Australian Petroleum Production and Exploration Association (APPEA) shows that around 100 exploration wells have been drilled in the last year, about half of them in off-shore areas.[4] The reasons for this low level of activity include high exploration costs, a success rate that is considerably lower than in other countries and relatively small discoveries compared to other countries. As APPEA pointed out in its submission:

> The offshore Australia region success rate for commercial oil discoveries was 6.5 percent (that is on average one in fifteen exploration wells drilled in the study period resulted in a commercial petroleum discovery in offshore Australia). This compares to a global average success rate of 17 percent. …In addition to the low success rate, the average commercial discovery size in offshore Australia was small compared to other regions (28 million barrels for oil and 197 billion cubic feet for gas).
>
> The implications of the above factors is that overall, Australia rates poorly as a result of low average commercial discovery rates and relatively small discovery sizes.

4.9 APPEA was of the view that Australian policy settings need to be adjusted to improve Australia's relative attractiveness as an investment destination on a risk

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2 Wright D (Geoscience Australia), *Proof Committee Hansard* Canberra 18 August 2006, p.51.

3 ABARE, *Submission* 166, p.4.

4 APPEA, *Submission* 176, p.4.

adjusted basis.[5] APPEA also sought an extension of Geoscience Australia's pre-competitive geoscientific information program.[6]

4.10 The Committee notes that the Government has introduced a number of initiatives to stimulate local exploration activity. These include:

- the introduction of a 150 per cent uplift factor in relation to Petroleum Resource Rent Tax (which APPEA described as being of 'limited interest' as it only benefits those companies who are currently producers);
- On 14 August 2006, the Prime Minister announced the allocation of an additional $76.4 million over the next five years to expand Geoscience Australia's pre-competitive data acquisition program; a review of the exploration policy framework; and $58.9 million to allow Geoscience Australia to 'to pioneer innovative, integrated geoscientific research to better understand the geological potential of onshore Australia for both minerals and petroleum.'[7]

Committee comments

4.11 It remains to be seen whether the Government's initiatives will have a significant effect on exploration activity, or if they do, whether significant reserves will be found, and if they are found, whether the cost of extraction will generate a fuel price that is competitive with the alternatives.

4.12 It is widely acknowledged that Australia will continue to use oil for transport fuel needs in the immediate future, notwithstanding the reduced demand that could be facilitated through the adoption of mandatory fuel efficiency standards, CNG, LPG and biofuels. As such, it is prudent to look for further domestic resources of both oil and gas whilst at the same time reducing demand as cited above, through investment in public transport and alternative fuels and their distribution networks. The question must be asked however of what is the appropriate level of resources that Governments and corporations should devote to exploring for more oil, instead of ways to reduce fossil oil dependence. The costs and benefits of more exploration must be assessed against the costs and benefits of other options to reduce oil dependence.

4.13 While more oil discoveries in Australia may improve the balance of payments by replacing imports, this cannot be expected to affect the price of fuel in Australia, as the oil price is set in the world market.

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5 APPEA, *Submission* 176, p.7.

6 Robinson B. (APPEA), *Proof Committee Hansard* Canberra 11 August 2006, p.9.

7 Hon. J. Howard, Prime Minister, *Statement on Energy Initiatives*, House of Representatives Hansard, 14 August 2006, p.26. Department of Prime Minister and Cabinet, *Support for Offshore and Onshore Exploration: August 2006 Update*, retrieved from http://www.dpmc.gov.au/initiatives/docs/exploration.rtf. on 01/09/2006

Biofuels

4.14 Two main biofuels are commonly mooted as alternatives to conventional oil. These are ethanol and biodiesel. These fuels are promoted by some groups for two main reasons. These are, that they reduce reliance on fossil fuels; and they are allegedly carbon neutral, being produced from renewable sources.

4.15 Ethanol is currently produced in Australia from either sugarcane, generally using molasses as a feedstock, or from grain. Ethanol is now available in Australia as a petrol blend in a limited number of locations, most visibly marketed by BP Australia as E10. A number of independent petrol retailers also sell ethanol blends, and Shell's premium fuel, Optimax Extreme, contains 5 per cent ethanol.

4.16 Biodiesel may be manufactured from a range of sources including waste cooking oils, tallow and from crops such as canola and palm oil. The Committee has received evidence from groups who consider that there are a number of other possible biodiesel sources that could be developed in Australia, for example by growing high yielding non-foodcrop plants specifically for fuel production. A limited amount of biodiesel is produced in Australia and it is not readily available, except in a very small number of locations. BP plans to market a diesel blend that is formulated in part (5 per cent) from a hydrogenated tallow product.

4.17 While there are a range of groups that actively promote the use of biofuels as an alternative to oil based products, there appear to be significant unresolved questions in relation to such fuels. However, all have a role to play in oil substitution and the transition to greater sustainability. There are issues in relation to biofuels which must be addressed and these include:

- The energy return on investment (EROI) of such fuels, significant fossil fuel inputs being required to produce them;
- Production capacity, whilst unlikely to be sufficient to provide a significant proportion of current requirements using existing technology, will satisfy a niche;
- The potential for competition between fuel production and food or textile production in land use;
- The need to ensure that oil for biodiesel is produced sustainably and does not drive tropical deforestation for palm oil plantations for example; and
- Government intervention by way of partnership or collaborative arrangement such that diesel manufacturers adjust their warranty to enable the use of more than 5 percent biodiesel in their engines. The same applies for ethanol where governments need to resolve the lack of international consistency about the level of concentration of ethanol in vehicles and in fuel storage and dispensing equipment.

4.18 Nonetheless, during the inquiry, the Committee's attention was drawn to several interesting technical innovations that may allow the wider use of biofuels,

permitting them to make a more significant contribution to the transport task, as well as potentially reducing CO_2 emissions from transport.

4.19 Among the most interesting of these is the potential use of lignocellulose to produce ethanol, whilst at the same time offering biodiversity and salinity benefits. The Western Australian example demonstrates that by identifying an endemic species such as oil mallees for possible biofuel production there are considerable benefits, including a considerable improvement in the energy return on investment.[8] Lignocellulose is woody or fibrous plant material and is available in very large quantities. A submission from an Australian research company, Microbiogen, argued that the sugar industry alone produces sufficient quantities of lignocellulose in the form of bagasse to produce enough ethanol to replace at least 10% of the Australia's oil consumption.[9]

4.20 Research is currently being conducted in several countries, including Australia and the United States, on the methods of using lignocellulose. The Committee found the Microbiogen evidence interesting, as this company appears to be making significant advances in this area. If this process can be commercialised, vastly larger amounts of feedstocks would become available for ethanol production. Microbiogen considers that the process may be viable within 2 to 3 years.[10]

4.21 Evidence was also provided to the Committee of processes under consideration in Europe for gasifying biomass and using the product for synthesising fuels using catalytic processes, and for producing biodiesel from algae.[11] However, the Committee has not received information about the economics of such processes, nor how far they are from commercialisation.

4.22 The Committee notes that the Government has set a modest target for the production of biofuels of 350 million litres by 2010. This represents less than one per cent of Australia's current use of liquid fuels for transport.[12] This should be substantially increased if we are going to move to secure Australia's energy future. The government must facilitate the achievement of such a goal through incentives to roll-out an adequate distribution network throughout the country.

Non-conventional petroleum

4.23 Technologies have been readily available for several decades for synthesising liquid transport fuels from either natural gas or from coal. During the apartheid era,

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8 H. Wu & M. Ewing, *Submission 179.*

9 Microbiogen, *Submission 92*, p.4.

10 Microbiogen, *Submission 92*, p.4.

11 Schuck S. (Bioenergy Australia), *Proof Committee Hansard* Sydney 9 June 2006, p.74

12 Demand for petroleum-based transport fuels was about 42,500 million litres in 2003-04. Department of the Prime Minister and Cabinet, *Report of the Biofuels Taskforce,* August 2005, p.36

South Africa produced all its liquid fuels from coal using the Fischer-Tropsch process and still produces 40 per cent of its fuel needs though this process.[13] There are plants under construction in several countries for producing what is known as GTL diesel (gas-to-liquids) diesel from natural gas. Both of these possibilities are under active consideration in Australia. For example the Committee received a submission and took evidence from the Sasol-Chevron company, which advocates the construction of a GTL diesel plant in Western Australia. The Monash Energy consortium, which has also given evidence to the Committee, is investigating the feasibility of constructing a coal-to-liquids plant in the Latrobe Valley in Victoria.

4.24 According to ABARE, these processes become commercially viable once the long-term oil price is above US$40-45 per barrel.[14]

4.25 The investment required for building plants to produce fuels from gas or coal is very large, and this is an obstacle to this alternative in the face of uncertainty about the longer term oil price. Sasol Chevron told the Committee that building a plant to produce 200,000 barrels of oil equivalent from natural gas would require an investment of approximately $20 billion.[15]

4.26 ABARE suggests a capital cost of US$50-70,000 per barrel of daily capacity for a coal-to-liquids plant, and US$25-40,000 for a gas-to-liquids plant. This compares with the cost of a conventional refinery of about US$15,000 per barrel of daily capacity.[16]

4.27 The evidence available to the Committee indicates that there are also environmental penalties associated with these processes, which result in substantially greater CO_2 production than conventional oil. This is because in addition to tailpipe emissions, substantial energy is consumed in the conversion process.

4.28 Sasol Chevron however claimed that on a well to wheels basis, its technology for producing GTL diesel is on a par with conventional oil:

> Sasol Chevron, ConocoPhillips and Shell International Gas commissioned a study by Five Winds International to report on the Life Cycle Analysis of GTL production. The study found that production and use of GTL fuel can contribute less greenhouse gas and reduced emissions to the atmosphere than production and use of conventional diesel fuel.[17]

4.29 The Committee has not verified these claims or the basis on which they are made.

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13 Sasol Chevron, *Submission* 54, p. 4.

14 Australian Commodities, June 2006, p. 306.

15 Sasol Chevron, *Submission 54*, p.11.

16 Australian Commodities, June 2006, p.306.

17 Sasol Chevron, *Submission 54*, p.9.

4.30 The Monash Energy coal-to-liquids proponents propose to build a 60,000 barrels per day plant (at a cost of $5 billion) with a projected commissioning date of 2016. The Company intends to rely on CO_2 geo-sequestration to manage the expected high CO_2 emissions. The company claims that this project would have significant economic benefits, including avoiding $80 billion in oil imports over 50 years, spending $20 billion on goods and services (mainly within Australia); and paying $15 billion in corporate income tax.[18]

Committee view

4.31 While coal-to-liquids, gas-to-liquids and other options such as producing transport fuels from oil shales may technically meet a large proportion of Australia's transport fuel needs, the Committee notes that their price will be significantly impacted by the imposition of a price on carbon dioxide emissions. The risk associated with investment in an uncertain regulatory environment coupled with uncertainties about the longer term oil price may make them less appealing to investors. Coal-to-liquids, if it is to avoid greatly increasing Australia's already substantial emissions of CO_2, must rely on geo-sequestration of carbon dioxide, a technique which is as yet unproven in this country and which is unlikely to be economically viable in the absence of a price on carbon. At this stage it is not possible to determine the cost of geo-sequestration, and therefore to determine what the comparative cost of coal-to-liquids as compared to other alternative fuels may be. Even with geo-sequestration, coal to liquids as a fuel generates comparable tail pipe emissions with conventional oil, therefore providing no overall benefit at considerably higher price. These are substantial risks.

Gaseous fuels – natural gas, LPG and hydrogen

4.32 While Australia has limited and declining supplies of conventional oil and now has to import oil to meet demand for transport fuel, it is endowed with large amounts of natural gas, which is principally methane. Supplies are estimated to be sufficient to last at least a hundred years at the current rate of use. Other hydrocarbon gases such as propane and butane are also commonly found in association with natural gas, as well as the condensate which now makes up a significant proportion of Australia's oil reserves.

4.33 The Committee received evidence from a number of witnesses that advocated the use of these gaseous fuels as a substitute for imported oil. Natural gas was also suggested as a bridging fuel to a hydrogen based transport system. Proponents argue that using locally produced gaseous fuels could have significant economic benefits by reducing the impact on the balance of payments that will otherwise result from the inevitable decline in oil self-sufficiency. They also argue that using domestically produced gaseous fuels would provide a degree of energy security by reducing dependence on oil produced in the Middle East. Further, they point to environmental

18 Monash Energy, *Submission 58.*

benefits of using these fuels, as they generally burn cleaner than oil products and produce less CO_2 for each unit of energy supplied. The three principal gaseous fuels commonly discussed are natural gas, liquid petroleum gas (LPG) and hydrogen.

Natural gas

4.34 Natural gas (methane) can be successfully used as a transport fuel, but its use in Australia for this purpose is very limited. The Asia Pacific Natural Gas Vehicles Association (ANGVA) was amongst several who advised the Committee of considerably wider use of natural gas as a transport fuel in other countries. The ANGVA said that in Brazil, there are in excess of 1 million natural gas vehicles on the road; and that the European Union had set a target for 10 percent of vehicles to run on this fuel by 2020.[19] Similarly, Motive Energy stated that the market penetration of natural gas vehicles was up to 30 per cent in some countries.[20]

4.35 Natural gas can be used in both diesel and petrol engines. Both require extensive modification, but the technology is regarded as mature. Cummins Australia[21] told the Committee that it now has in excess of 12,000 gas engines (ie: heavy diesel engines built specifically to operate on gas) in operation around the world. The market penetration of natural gas in the heavy vehicle fleet in Australia is however minimal, although the Committee is aware that a number of public authorities are trialling the use of natural gas buses, and Boral is using natural gas to power some of its shorter haul trucks such as concrete agitators.

4.36 Natural gas has both advantages and disadvantages as a transport fuel. Its advantages include its ready availability, gas being reticulated to 70 per cent of Australian urban areas; its relative abundance; price stability; and considerable environmental advantages. Disadvantages include the weight and size of cylinders necessary to store the gas on board; limited range; a considerable energy cost associated with compressing and liquefying gas where it is used as liquefied natural gas (LNG), and the cost of conversion.

4.37 The absence of refuelling and distribution infrastructure is a considerable obstacle to its wider use. As a consequence, there are very few natural gas cars or trucks in operation. Ford Australia told the Committee that it did a number of trials with compressed natural gas cars, but found that the size of the tanks that were necessary to give adequate range significantly intruded on luggage space, and range was limited.[22] The Committee is aware that some countries have experimented with home refuelling facilities, and these may offer a way to address the refuelling question.

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19 Asia-Pacific Natural Gas Vehicles Association, *Submission 75*, p.1..

20 Motive Energy Pty Ltd, *Submission 64*, p.17..

21 Cummins South Pacific, *Submission 84*, p.2.

22 Mr R. Scoular (Ford Motor Company of Australia Ltd), *Proof Committee Hansard,* 11 August 2006, p.32.

4.38 The Committee is of the view that it would be prudent to put in place measures to encourage the rapid take-up of natural gas in the transport fuels mix. Several submissions offered suggestions of what measures could be put in place, in addition to the existing Alternative Fuels Conversion Program, if the Government wished to encourage the wider use of this fuel. These will be explored in more detail in the final report, but measures to encourage the provision of infrastructure and excise and pricing questions are critical and must be addressed.

Liquefied Petroleum Gas (LPG)

4.39 LPG is comprised of varying proportions of propane and butane. It can be produced as a result of the oil refining process, but also occurs naturally in oil and gas wells, where it can be readily separated out from other gases.

4.40 LPG's principal advantage over natural gas is that it liquefies readily and does not have to be stored under refrigeration to remain a liquid. Consequently, it can be stored in smaller and lighter cylinders than natural gas, and offers superior vehicle range. It also offers environmental advantages over liquid fuels, but its combustion produces more CO_2 than natural gas.

4.41 Australian LPG resources are claimed to be relatively abundant, although not as extensive as natural gas. The Australian Liquefied Petroleum Gas Association (ALPGA) told the Committee that substantial reserves of LPG will continue to be available until at least 2020. ABARE estimates that Australia's demonstrated LPG reserves are currently 210 gigalitres, less than the estimated condensate reserves of 247 gigalitres.[23]

4.42 The market penetration of LPG is supported by extensive infrastructure, over 3,500 filling stations being available.[24] The Committee notes the recent Government initiatives to encourage motorists to take up this fuel by paying a subsidy of $2000 for a conversion and $1000 towards the cost of a new vehicle with LPG fitted.

4.43 The Committee agrees that LPG may be a suitable substitute fuel for petrol in some vehicles, but questions whether supply is sufficient to support a large proportion of the current fleet being converted to operate on it. This and other issues will be examined more extensively in the final report.

Hydrogen

4.44 Hydrogen is often put forward as an alternative transport fuel, although it is more correctly described as an energy carrier. Theoretically, a vehicle fuelled by hydrogen would have zero emissions. However, what is often overlooked is that hydrogen does not occur naturally and must be produced as part of a manufacturing process. It can be produced by reforming natural gas, coal or biomass, or by

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23 Department of Industry, Tourism and Resources, *Energy in Australia 2005.*

24 ALPGA, *Submission 91*, p. 5.

electrolysis, but currently, substantial CO_2 emissions accompany all of these methods of producing this fuel.

4.45 There are formidable technical issues to be overcome before hydrogen could be widely used as a transport fuel. These include the very large amounts of energy required to compress it and maintain it in a liquid state suitable for transport fuel use, storage problems arising from its propensity to leak through the walls of metal pipes and tanks, the lack of a source of supply, and a complete lack of distribution infrastructure. In the Committee's view it is a fuel that might be considered in the distant future, but is not a useful option to consider in Australia's current or medium term transport fuels mix.

Chapter Five

Demand side responses

5.1 Demand side responses to reduce oil dependence have two main strands:

- increasing the fuel-efficiency of vehicles;
- reducing the demand for fossil-fuelled transport (or at least, restraining its growth). Under this heading, the main ideas mentioned in submissions were encouraging more use of railways for long-distance freight; encouraging walking, cycling and public transport in cities; and promoting urban planning policies that reduce the need to travel long distances.

5.2 Demand side responses can also serve other goals, such as controlling urban congestion and pollution, and reducing greenhouse gas emissions.

Increasing the fuel efficiency of vehicles

5.3 Since 1979 the fuel efficiency of light vehicle engines has increased significantly - from about 5 to 4 litres per 100km per vehicle tonne. However the efficiency of the light vehicle fleet has improved more slowly, as consumers have moved to larger, more powerful cars. In the latest figures by the Bureau of Transport and Regional Economics, the National Average Fuel Consumption (NAFC) of new passenger cars in 2001 was 8.28 litres/100km.[1]

5.4 The Federated Chamber of Automotive Industries has a voluntary code of practice which calls for a NAFC target for new passengers cars of 6.8 litres/100km by 2010.[2] The Australian Automobile Association commented that 'achievement of this target will depend on a range of factors including the implementation of existing technology and the quality and availability of fuel to meet advanced engine and emission technologies.'[3] It will also depend on consumers' choices about the size of vehicles.

5.5 It is of course possible to allow the market to choose the fuel economy of vehicles having regard to the price of fuel. This has been the practice to date. There is evidence that the higher petrol prices of the last 18 months have turned consumers towards smaller cars.[4]

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1 BTRE information sheet 18, *Fuel consumption by new passenger vehicles in Australia*, 2001. Australian Automobile Association, *Submission 151,* p.10.

2 FCAI, *Voluntary Code of Practice - Reducing the Fuel Consumption of New Light Vehicles*, 15 April 2003.

3 Australian Automobile Association, *Submission 151*, p.10

4 Federated Chamber of Automotive Industries, *Small cars drive half yearly motor vehicle sales,* media release 5 July 2006.

5.6 As a matter of policy government should encourage more fuel efficiency than the market will provide, by mandating fuel efficiency standards; by incentives to favour smaller or more efficient cars (for example, by adjusting registration charges); or by raising the fuel excise as an environmental measure. This would have the added benefit of securing vehicle manufacturing jobs in Australia.[5]

5.7 Upgrading the national car fleet would be facilitated by government mandating the use of fuel efficient and hybrid vehicles in the government car fleet, which traditionally feeds into the taxi and second-hand car market.

5.8 Any proposal to increase fuel excise as an environmental measure would have to consider the distributional effects. People in the outer suburbs of cities and in rural and regional areas would be most affected. These people spend a relatively high proportion of their income on transport already, and for most purposes have no public transport alternatives. Positive measures to provide more alternatives to the use of cars would probably be more politically acceptable.

More use of rail for long distance freight

5.9 Many submissions argued for more use of railways for long distance freight. Trains use about one third the fuel of trucks per net tonne kilometre.[6]

5.10 At present road and rail have about equal shares of Australia's total freight transport task in tonne/kilometres (35% and 37% respectively, with 28% sea and 1% air). However the vast majority of the rail task (86%) is transporting bulk commodities such as coal and ore. Road performs about 75% of the non-bulk freight task. It is suggested that only about 15-20% of total freight is 'contestable' - realistically open to competition between road and rail.[7] This is primarily non-bulk freight over longer distances on the main intercity routes. The advantage of rail increases with distance, as the lower line haul cost begins to outweigh the cost of transhipping at the journey's

5 'In another blow for the troubled domestic car industry, one of Australia's largest car rental networks [Europcar] has opted to phase out most of the locally made six cylinder vehicles in its fleet in favour of more fuel-efficient imports.' Australian Financial Review, 1 September 2006, p.11

6 Rail 0.0085, road 0.0265 litres per net tonne kilometre: Bureau of Transport Economics, *Competitive Neutrality Between Road and Rail*, working paper 40, 1999, p59. Figures are for non-bulk freight on an 'average' interstate corridor, and allow for typical load factors. Fuel efficiency of both road and rail has probably increased since then.

7 A larger proportion of freight would be on routes where rail service could theoretically be provided, but would not be viable because of the overwhelming natural advantages of road service on those routes.

beginning and end. The rail share of land freight on these routes ranges from 10-15% (Sydney-Melbourne) to 70-80% (eastern states-Perth).[8]

5.11 The Bureau of Transport and Regional Economics (BTRE) expects that on present trends, assuming no significant change in infrastructure, the long term decline in rail's mode share will continue on most routes. However if there was significant improvement to rail infrastructure the result might be different.[9]

5.12 This situation has arisen partly because of the competitive advantage of road in speed and reliability (qualities which have become more important in the age of 'just in time' logistics); partly because of a history of poor rail management by former public authority owners; and partly because of past government policies to invest heavily in improving roads and comparatively little in improving railways.

5.13 Commonwealth policy recognises that the rail system has been underfunded in the past and has the potential to increase its share of the freight task if there are improvements to infrastructure and modernisation of operating practices.[10] The Commonwealth has committed $2.4 billion to rail improvements over the 5 years to 2008-9, mostly for the Melbourne-Sydney-Brisbane corridor.[11] In the longer term, Auslink 'corridor strategies' promise a balanced assessment of the road and rail infrastructure needs of key corridors for the sake of the most efficient overall outcome.

5.14 The Australian Trucking Association supports the need for investment in railways, but is concerned that the road freight industry should not 'have imposts put on our business simply to make rail more competitive.'[12]

Comment

5.15 Fuel efficiency or possible oil depletion do not figure particularly in the 2004 Auslink White Paper. The Auslink policies and first five year program are based on goals of general economic efficiency, considering the predicted strong growth of

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8 Department of Transport and Regional Services, *Auslink White Paper*, 2004, p.3. Australasian Railway Association, *Australian Rail Industry Report 2003,* p.9. Mr S. St Clair (Australian Trucking Association), *Proof Committee Hansard* 12 May 2006, p.85. Bureau of Transport and Regional Economics, *Freight between Australian Cities, 1972 to 2001*, information sheet 22. BTRE, *Freight Measurement and Modelling in Australia*, report 112, 2006, p.xxiii.

9 BTRE, *Freight Measurement and Modelling in Australia*, report 112, 2006, p.xxiii.

10 Department of Transport and Regional Services, *Auslink White Paper*, June 2004, p.62

11 This is a combination of grants under Auslink funding programs; direct grants to the Australian Rail Track Corporation, which controls the main interstate routes; and the ARTC's own investment (the ARTC is Commonwealth owned).

12 Mr S. St Clair (Australian Trucking Association), *Proof Committee Hansard* 12 May 2006, p.85.

freight transport over the next 20 years.[13] However it may be expected that if there is a long term rise in the price of fuel, this will favour rail because fuel is a greater proportion of costs for road transport. This may suggest a need to increase the pace of catchup investment in rail infrastructure.

Encouraging walking, cycling and public transport in cities

5.16 Many submissions argued for increased use of walking, cycling and public transport in cities, as a way of reducing transport fuel use, or at least restraining its growth.

5.17 In Australian cities typically 75-90% of all trips are by car, 5-10% by public transport, and the rest by cycling or walking.[14] In the last 20 years public transport use has increased slowly, broadly in line with population growth, but public transport use as a proportion of all trips has been flat or declining slightly as car use increases faster.[15] A major reason for this is that as cities have grown outwards a greater proportion of people live in fringe areas that require more travel and are poorly designed for public transport.

5.18 Some increase in public transport use in the last year has been reported, presumably as a result of petrol price rises. However such increases are mostly quite small in percentage terms. Another line of reporting stresses that most motorists have no alternative but to use their cars.

5.19 Ambitious goals for increasing the public transport mode share are commonly seen in official plans.[16] In some cities there has been significant investment in this: for example, Perth has electrified and extended its suburban rail network over the last 15 years, leading to a three-fold increase in use. The goals of these policies seem to be to control congestion and pollution, to give people more transport options, and to improve the mobility of people without cars. Reducing oil dependency would be an additional benefit.

5.20 Submissions regretted that the Commonwealth refuses to be involved in improving urban public transport infrastructure. They pointed out that in many other

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13 The 2004 Auslink White Paper in one line flags the possible issue of 'depletion of fossil fuel supplies before alternative energy sources are developed' (p115), but makes no further comment.

14 The public transport share is usually somewhat higher in peak hours, and for travel to Central Business Districts.

15 Australasian Railway Association, pers. comm. August 2006 based on research in progress.

16 For example, there are official goals to increase the public transport mode share from 7% to 10.5% in South East Queensland by 2011 *(Transport 2007);* from 9% to 20% of motorised trips (thus about 15% of all trips) in Melbourne by 2020 *(Melbourne 2030)*; to reduce car-as-driver trips in Perth by one third by 2029 (*Perth Metropolitan Transport Strategy 1995-2029*); to increase the proportion of peak hour commuting by public transport (*A New Direction for NSW - State Plan*, 2006).

countries federal governments do contribute to urban public transport infrastructure.[17] The recent House of Representatives report *Sustainable Cities* recommended that the Commonwealth should support provision of major urban public transport infrastructure.[18] The Commonwealth's current policy is that public transport is the responsibility of the States.[19]

Comment

5.21 Increasing walking, cycling and public transport use in cities is a worthwhile goal for a number of reasons, regardless of predictions about the oil future. If there is a long term rise in the price of oil, it will be all the more necessary.

5.22 However we should not underestimate the difficulties involved. Vast areas of post World War 2 suburbia have been designed on the assumption that most travel would be by car, and with the aim of making this easier. The effect has been to make travel in any other way more difficult, as activity centres disperse to sites distant from the public transport network, and the environment for pedestrians and cyclists is degraded by traffic. In these areas existing public transport routes do not serve many travel needs, and existing services mostly function as welfare for people without cars, with a very low proportion of total trips (less than 5%).

5.23 Turning around this situation requires better public transport services **and** supportive planning policies to shape urban development so that public transport networks can work efficiently and attract more 'choice' customers. This means, for example:

- encouraging commerce and employment to locate at strongly planned regional centres, so that public transport networks have somewhere to focus on;
- new subdivisions to be planned so that buses can be routed efficiently;
- transit-oriented development: medium density mixed-use development around public transport nodes (this will usually mean rail stations, since rail best provides the visibility and permanence needed to attract this sort of development);
- design principles to give high priority to a quality pedestrian environment.

5.24 Urban strategic planning is the responsibility of State and Territory governments. The needed initiatives involve State and local government. Most of them require regional scale planning going beyond the boundaries of any one local government area.

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17 Prof. P. Newman, *Proof Committee Hansard* 12 April 2006, p.43

18 House of Representatives Standing Committee on Environment and Heritage, *Sustainable Cities*, 2005, recommendations 6 & 7.

19 Department of Transport and Regional Services, *Auslink White Paper*, 2004, p.9

5.25 In all these matters, the aim of policy is to change people's travel behaviour at the margin. In the foreseeable future walking, cycling and public transport will continue to be unsuitable for many travel needs. The aim is to encourage them where they are suitable. A commonly stated goal is to increase the public transport mode share from 10% to 20% of trips. On the positive side, because the present public transport share is so low, only a small behavioural change by motorists would be needed to greatly increase public transport use.[20] This would make better services more viable.

Other matters: fringe benefits taxation of company cars

5.26 Many submissions argued that the concessionary tax treatment of cars as a fringe benefit should be abolished. They argued that the concession encourages the use of cars for commuting and is contrary to widely held government policy goals to promote public transport and restrain urban traffic congestion.

5.27 The concession was worth about $1.1 billion in 2004-5.[21] The tax forgone is about 43% of the tax that would be collected if the taxable fringe benefit was calculated accurately. The concession is worth, on average, about $2,300 per vehicle.[22]

5.28 The statutory formula method of calculating the tax liability, which creates the concessionary aspect, was adopted to minimise compliance costs and to support the Australian car industry, which at the time (1986) attracted significant government support and provided nearly 85% of car sales.

5.29 The Institute of Chartered Accountants in Australia (the ICAA) argues that the concessionary treatment should be ended, since:

- it undesirably distorts economic behaviour;
- as a way of assisting the Australian car industry it is poorly targeted, as now only 29% of new cars are Australian-made.

5.30 The ICAA points out that the question of minimising compliance costs is distinct from the question of whether the tax should be concessionary. A statutory formula method could be maintained for the sake of easy compliance, while the concessionary aspect could be removed by adjusting the rates.[23]

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20 For example, if car and public transport trips are now in the ratio 9 to 1, and 10% of car trips become public transport trips, this would almost double public transport use.

21 Treasury, *Tax Expenditures Statement 2005*, p.125

22 Based on about 463,000 affected vehicles in 1999-2000, the last year for which figures are available. The Institute of Chartered Accountants in Australia, *Fringe Benefits Tax - Decision Time,* 2006, p.19.

23 The Institute of Chartered Accountants in Australia, *Fringe Benefits Tax - Decision Time,* 2006, p.19.

Comment

5.31 The Committee notes that the Council of Australian Governments (COAG) in February 2006 resolved to investigate options for managing urban traffic congestion consistent with jurisdictional responsibilities.[24] The Committee suggests that this should include the Commonwealth reconsidering the policy behind the concessionary fringe benefits tax on cars.

5.32 The Committee suggests investigation of a concessionary scheme for provision of public transport access by employers, and investigation of other tax measures to discourage urban congestion.

Senator Rachel Siewert
Chair

24 COAG communique, 10 February 2006.

Appendix One

List of Submissions

1. Mr Eriks Velins

2. Mr Allan Heasman

3. Mr Martin Olmos

4. The National Committee on Transport, Engineers Australia

5. Mr Pat Naughtin

6. Mr Alan Kleidon

7. Ms Janet Marsh

8. Mr Loris Erik Kent Hemlof

9. Mr L.J Harper

10. ASPO Ireland

11. Professor Peter Newman

12. Alan Parker Design

13. Mr Adam Butler

14. Mr John Schindler

15. Mr Peter Robertson

16. Mr Chris Shaw

17. Mr Mervyn Couper

18. Mr Mark Robson

19. City of Wanneroo

20. Mr Robin Collin

21. China University of Petroleum

22. CONFIDENTIAL

23. Mr Ray Dowsett

24. ASPO – Australia Biofuels Working Group

25. Dr Jeremy Wilkinson

26. Mr David Rice

27. Mr James Ward

27A Mr James Ward

28. Mr Stephen Kovacs

29. Mr David Bell

30. Mr Llewellyn Wishart

31. Engineers Australia

32. The International Association of Public Transport (Australia/NewZealand)

33. Mr David Green

34. Mr Don Durrett

35. Mr Paul Pollard

36. Australian Cane Growers' Council Ltd

37. Mr David Finlay

38. Western Australian Cycling Committee

39. Cecile Storrie

40. Dr David Bennett

41. Mr David Yap

42. Mr Phil Connor

43. Western Sydney Regional Organisation of Councils Ltd

44. The Understandascope, The Monash Science Centre

45. Sustainable Transport Coalition WA

46. Mr Paul Eistis

47. Mr David Huck

48. ASPO-Australia Indigenous Working Group

49. ASPO-Australia Agriculture, Fisheries and Food Working Group

50. Advanced Fuels Technology Pty Ltd

51. Mr Peter Flanagan

52. Mr John Evans

53. Murray Goulburn Co-operative Company Limited

54. Sasol Chevron Consulting Ltd

55. Livestock Feed Grain Users Group

56. City of Wanneroo

57. Mr David Allen

58. Monash Energy Holdings Limited

59. Mr Keith Skipper

60. Office of Industry and Innovation
University of Western Australia

61. Mr David Wanless

62. Southern Metropolitan Regional Council

63. Mr Aaron Nielsen

64. Motive Energy Pty Ltd

65. Mr Michael Dwyer

66. Mr Lionel Orford

67. ASPO-Italia

68. Biodiesel Association of Australia

69. Mr Matt Mushalik

70. Ms Caroline Le Couteur

71. Mr Peter Nattrass

72. Mr Alex Roberts

73. Advanced Engine Components Limited

74. Mr Brian Fleay

74A Mr Brian Fleay

74B Mr Brian Fleay

75. Asia-Pacific Natural Gas Vehicles Association

76. Mr Michael Gutteridge

77. Mr John Harland

78. Mr John Bowman

79. ASPO-Australia Finance and Economics Sector Working Group

80. Torquay Landcare Inc.

81. Sydney South West Area Health Service

82. Mr Peter Bartlett

83. Mr Harry Lewis

84. Cummins Inc. (Australia)

85. Bioenergy Australia

86. Mr Svargo Freitag

87. WA Farmers Federation

88. Australian Medical Association

89. Council of Social Service of New South Wales

90. Mr Greg Smith

91. Australian Liquefied Petroleum Gas Association Ltd t/a LPG Australia

92. Microbiogen Pty Ltd

93. Enecon Pty Ltd

94. Climate Change Australia (Manning Branch)

95. Natural Fuels Australia Ltd

96. Mr Donald Coventry

97. City of Whitehorse

98. Wesfarmers Kleenheat Gas Pty Ltd

99. The City of Newcastle

100. Public Transport Users Association Inc. & Environment Victoria

101. CONFIDENTIAL

102. RESIDential Environments Project Team

103. Cr Chris Aubrey, City of Whitehorse

104. Research Institute for Sustainable Energy

105. Envestra Limited

106. Boral Transport Limited

107. The Pedestrian and Bicycle Transport Institute of Australasia

108. Mr Paul Johnson

109. Walking WA Committee, Western Australia

110. Greenfleet Australia

111. Mr Les Chandra

112. Brunswick Bicycle User's Group

113. The Solar Shop

114. Ms Philippa Clarkson

115. Bendigo Bicycle Users Group

116. ACT Peak Oil

117. Emergent Futures

118. Sustainable Population Australia inc

119. The Natural Gas Vehicles Group Pty Ltd

120. Queensland Farmers Federation

121. Holmgren Design Services

122. Dr Melanie Fitzpatrick

123. Mr Noel Child, Mr Oliver Clark AM & Mr Simon Humphries

124. Municipal Association of Victoria

125. Mr Lex Creemers

126. Mr Stephen Gloor

127. Geoscience Australia

128. CSIRO

129. Bus Industry Confederation

130. Cyclists' Action Group

131. Australian Trucking Association

132. ASPO-Australian Oil & Gas Industry Working Group

133. ASPO-Australia Working Group on Urban and Transport Planning

134. ASPO-Australia Social Services Sector Working Group

135. ASPO-Australia

135A ASPO- Australia

135B ASPO Australia

136 ASPO-Australia Active Transport Working Group

137 ASPO-Australia Construction Industry Working Group

138 ASPO-Australia Health Sector Working Group

139 Mr John Caley

140 Dr Philip Laird, University of Wollongong

141 Dr Colin Endean

142 CONFIDENTIAL

143 Hydro Tasmania

144 Cycle-Safe, Armidale

145 Australian Fodder Industry Association Inc.

146 ASPO-USA

147 Ms Mary Sweetapple

148 CSR Limited

149 ASPO-International

150 Mr Daniel Boon

151 Australian Automobile Association

152 Australian Conservation Foundation

153 Centre for Low Emission Technology

154 Australian Academy of Technological Sciences and Engineering

155 Queensland Government

156 Tathra Street

157 Wyndham City Council

158 Western Transport Alliance

159 Gecko – Gold Coast and Hinterland Environment Council

160 Railway Technical Society of Australasia

161 Bicycle Federation of Australia & Cycling Promotion Fund

162 Society for Underwater Technology

163 Public Health Association

164 Mr Brian Merchant

165 Urban Research Program

166 Australian Bureau of Agriculture and Resource Economics

167 Ford Motor Company of Australia Limited

168 Maritime Union of Australia

168A Maritime Union of Australia

169 Pacific National

170 Mr Ben Rose

171 Department of the Environment and Heritage

172 Department for Planning and Infrastructure
Government of Western Australia

173 BP Australia Pty Ltd

174 CONFIDENTIAL

175 Mrs Kim Bax

176 Australian Petroleum Production & Exploration Association

177 Capt. Peter Ireland

178 Australian Institute of Petroleum Ltd

179 Dr Hongwei Wu & Dr Mike Ewing

180 Dr Ross Kingwell

181 Shell Australia

182 QRNational

183 Australian ITER Forum

184 Mr Dennis Keith

185 Gardner Smith (Holdings) Pty Ltd

186 Mr Frank Crichlow

187 Dr Darren Phillips

188 DUT Pty Ltd

189 Mr Cy d'Oliveira

190 Renewable Fuels Australia

191 Waste and Fleet Services

192 Mr Donald Coventry

Appendix Two

Witnesses who appeared before the Committee at the Public Hearings

Tuesday, 11 April 2006
Legislative Council Committee Office
PERTH

Sustainable Transport Coalition
Dr David Bennett, Founder
Dr David Worth, Convenor

Office of Industry and Innovation, University of Western Australia
Mr Andrew Beveridge, Project Manger Commercialisation

Department of Agriculture and Food, Western Australia
Dr David Bowran, Grains Industry Development Director

Mr Brian Fleay, Private capacity

Research Institute for Sustainable Energy
Professor David Harries, Director

Department of Planning and Infrastructure, Western Australia
Mr Glen Head, Director, Perth Fuel Cell Bus Trial and Transport Sustainability

Wesfarmers Energy and LPG Australia
Mr Gary Ireson, Director, Gas and Power Wesfarmers Energy and President, LPG Australia

Department for Planning and Infrastructure
Mr David Rice, Principal Network Planning Office

ASPO Australia
Mr Bruce Robinson, Convenor

Sustainable Energy Association, Western Australia
Mr Matthew Rosser, Chair

Royal Automobile Club, Western Australia
Mr Michael Upton, Manager, Vehicle Policy

Public Transport Authority
Mr Tim Woolerson, Bus Fleet Manager

Wednesday, 12 April 2006
Commonwealth Parliament Offices
PERTH

Australian Association for the Study of Peak Oil and Gas
Mr Bruce Robinson, Convenor

Mr Brian Fleay, private capacity

Sasol Chevron Consulting Pty Ltd
Mr Anthony Pytte, Australia Country Manager

Office of Industry and Innovation, University of Western Australia
Mr Andrew Beveridge, Project Manager, Commercialisation

Research Institute for Sustainable Energy, Murdoch University
Professor David Harries, Director

Sustainable Transport Coalition
Dr David Bennett, Founder
Dr David Worth, Convenor

Institute for Sustainability and Technology Policy, Murdoch University
Professor Peter Newman, Director

Commonwealth Scientific and Industrial Research Organisation
Dr Beverly Ronalds, Chief, CSIRO Petroleum
Dr Cedric Griffiths, Theme Leader, Maintaining Australian Oil Self Sufficiency, CSIRO Petroleum

Advanced Engine Components Ltd
Mr Antony Middleton, Managing Director

Department for Planning and Infrastructure, Western Australia
Mr Glen Head, Director, Perth Fuel Cell Bus Trial and Transport Sustainability
Mr Iqbal Samnakay, Policy Officer

Mr Alexander Creemers, Private capacity

Western Australian Farmers Federation
Mr Trevor DeLandgrafft, President
Mr Ross Hardwick, Executive Officer

School of Science and Engineering, Murdoch University
Dr August Schlapfer, Lecturer, Energy Studies

Natural Fuels Australia Ltd
Mr Richard Selwood, Chief Executive Officer

Friday, 12 May 2006
Parliament House
CANBERRA

GeoScience Australia
Dr Clinton Foster, Chief, Petroleum and Marine Division
Mr Denis Wright, Chief Petroleum Engineer
Mr Stephen Le Poidevin, Senior Reservoir Engineer

Australian Bureau of Agricultural and Resource Economics
Dr Brian Fisher, Executive Director
Ms Karen Schneider, Acting Deputy Executive Director
Mr Graham Love, Manager, Energy Projections and Analysis Section, Energy and Minerals Branch
Dr Jammie Penm, Senior Analyst

Commonwealth Scientific and Industrial Research Organisation
Dr David Brockway, Chief, Division of Energy Technology

Engineers Australia
Mr Andre Kaspura, Policy Analyst

International Association of Public Transport
Mr Peter Moore, Executive Director

Livestock Feed Grain Users Group
Mr Kevin Roberts, Vice-President

ACT Peak Oil
Mr Alexander Pollard, Convenor, Chair and Submission Editor
Mr Leigh Kite, Treasurer and Public Awareness Campaign Manager

Australian Trucking Association
Mr Stuart St Clair, Chief Executive

Bicycle Federation of Australia
Mr Peter Strang, Executive Director
Mr Elliot Fishman, Director, Institute for Sensible Transport

Friday, 9 June 2006
Parliament House, Macquarie St
SYDNEY

CSR Ethanol Ltd
Mr Martin Jones, General Manager, Government Relations
Mr Gavin Hughes, General Manager

Western Sydney Regional Organisation of Councils Ltd
Councillor Anthony Hay, President
Mr Alexander Gooding, Executive Director
Ms Sharon Fingland, Assistant Director

Chartered Institute of Logistics and Transport Australia
Mr Leonard Harper, National Chairman & Executive Director

Biodiesel Association of Australia
Mr Adrian Lake, President
Dr Len Humphreys, Board Member
Mr Christopher Mapstone, Bowral–Marketing Manager–Biofuel, Gardner Smith Pty Ltd

Australian Liquefied Petroleum Gas Association Ltd
Mr Raymond North, General Manager
Mr Warring Neilsen, Chairman, Government Relations

Bioenergy Australia
Dr Stephen Schuck, Manager

Boral Ltd
Mr Mervyn Rowlands, Fleet Engineering Manager, Boral Transport
Mr Ian McKimm, Consultant

The Natural Gas Vehicles Group
Mr Kevin Black, Managing Director

Thursday, 29 June 2006
Joint Committees Administration Office
Melbourne

Monash Energy Holdings Ltd
Mr Jeffrey Gordon, Chief Executive Officer
Mr David Lea, Executive Adviser
Mr Stuart Lund, Chief Financial Officer

Advanced Fuels Technology Pty Ltd
Mr Sean Blythe, Chief Executive

Cummins Engine Company Pty Ltd
Mr John Bortolussi, Director

ASPO Australia
Mr Richard Campbell, Convenor, Finance Group
Dr Sheridan Mayo, Deputy Convenor

BP Australia Pty Ltd
Mr Ian Fliedner, Director, Communications and External Affairs
Mr William Frilay, Manager, Government Relations

Shell Australia
Mr Russell Caplan, Chairman
Mr Peter Scott, General Manager, External Affairs, Downstream

Western Transport Alliance & City of Wyndham
Mr Ian Robins, Chair, Steering Committee and Chief Executive Officer, Wyndham City Council
Mr Timothy Cottrell, Senior Traffic Engineer, Wyndham City Council

City of Whitehorse
Mr Keith Loveridge, Energy and Water Officer

Public Transport Users Association
Mr Timothy Long, Committee Member
Mr Cameron Tampion

Environment Victoria
Ms Louise Sales, Transport Campaigner

Friday, 30 June 2006
Jubilee Room, Parliament House
Sydney

Pacific National
Mr Gregory Green

Rail Technical Society of Australasia
Mr Andrew Honan, Chair, Government Relations Subcommittee
Mr Maxwell Michell, Member, Government Relations Subcommittee

Australian Cane Growers Council
Mr Bernard Milford, Senior Manager, Policy

Centre for Low Emission Technology
Dr Kelly Thambimuthu, Chief Executive Officer
Dr Graham Reed,Program Manager

Hydro Tasmania
Mr John Titchen, Manager, Technology and Commercialisation
Mr Lachlan Tait, Graduate Policy Analyst

Council of Social Service of NSW
Mr Dinesh Wadiwel, Senior Policy Officer

Dr Philip Laird, Private capacity

Microbiogen Pty Ltd
Dr Philip Bell, Manager, Research Innovation

Tuesday, 11 July 2006
Jubilee Room, Parliament House
Sydney

Dr Ali Samsam Bakhtiari, Private capacity

ASPO Australia Working Group on Urban Planning and Transport
Mr David Kilsby, Convenor

Griffith University
Dr Neil Sipe, Head of School, School of Environmental Planning

Friday, 11 August 2006
Parliament House
Canberra

Australian Petroleum Production and Exploration Association
Ms Belinda Robinson, Chief Executive
Mr Noel Mullen, Deputy Chief Executive
Mr Ranga Parimala, Director, Exploration and Access

Cooperative Research Centre for Greenhouse Gas Technologies
Mr Barry Hooper, Capture Program Manager

Ford Motor Company of Australia Ltd
Mr Russell Scoular, Government Affairs Manager

Industries, Communities and Energy Division,Australian Greenhouse Office
Mr Barry Sterland, First Assistant Secretary

Mr Gene McGlynn, Assist Secretary, Energy Efficiency and Community Branch
Ms Lynden Ayliffe, Assistant Secretary, Environment Standards Branch
Mr Michael Ward, Acting Director, Clean Fuels and Vehicles
Mr Chris Baker, Director, Fuels and Technology
Mr Paul Kesby, Director, Air Quality Section

Australian Institute of Petroleum
Dr John Tilley, Executive Director
Mr Paul Barrett, Deputy Executive Director
Mr Nathan Dickens, General Manager, Policy

Queensland Department of State Development, Trade and Innovation
Mr Phil Jardie, Manager, Processed Foods and Renewable Fuels Unit
Ms Siobhán Ahern, Principal Policy Officer, Processed Foods and Renewable Fuels Unit
Mr Bruce Harrison, Principal Policy Officer, Processed Foods and Renewable Fuels Unit

Friday, 18 August 2006
Parliament House
Canberra

Department of Transport and Regional Services (including BTRE)
Mr Mike Mrdak, Deputy Secretary
Mr Stewart Jones, General Manager, Transport Integration and Reform
Mr Phil Potterton, Director, Bureau of Transport and Regional Economics
Mr Peter Robertson, General Manager, Vehicle Safety Standards
Dr David Gargett, Research Leader, Bureau of Transport and Regional Economics
Mrs Lyn Martin, Senior Economist, Bureau of Transport and Regional Economics

Department of the Treasury
Dr Steven Kennedy, General Manager, Domestic Economy Division
Mr Patrick Colmer, General Manager, Indirect Tax Division
Mr Mark O'Connor, General Manager, Individuals and Exempt Tax Division
Mr John Hawkins, Manager, Commodities, External and Business Unit, Domestic Economy Division
Mr Martin Jacobs, Manager, Individuals Non-Business Unit, Individuals and Exempt Tax Division

Department of Industry, Tourism and Resources
Mr Bob Pegler, General Manager, Offshore Resources Branch
Mr Jeff Beeston, General Manager, Automotive, TCF and Engineering Branch, Manufacturing, Engineering and Construction Division
Dr Naomi Ashurst, Manager, Alternative Fuels and Fuel Supply Section
Mr Martin Squire, Manager, Petroleum Refining and Retail Section

Mr William Crawshaw, Manager, Resources Taxation Section, Safety, Taxation and Projects Branch, Resources Division
Mr Jonathan Chamarette, Resources Taxation Section
Mr Chris Lloyd, Manager, Major Projects Section, Safety, Taxation and Projects Branch, Resources Division

Geoscience Australia
Dr Clinton Foster, Chief of Petroleum and Marine Division
Mr Denis Wright, Chief Petroleum Engineer
Mr Stephen LePoidevin, Senior Reservoir Engineer

Australian Bureau of Agricultural and Resource Economics
Ms Karen Schneider, Deputy Executive Director
Dr Don Gunasekera, Branch Manager, International Branch
Mr Paul Ross, Brach Manager, Energy and Minerals Branch
Mr Graham Love, Section Head, Energy Projections and Analysis
Dr Jammie Penm, Acting Chief Commodity Analyst

Australian Automobile Association
Mr Lauchlan McIntosh, Executive Director
Mr John Metcalfe, Director, Research and Policy