Executive summary

CHAPTER 1 – Introduction

This inquiry was prompted by the question of whether Australia should be concerned about 'peak oil'. This term 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. [1.3]

CHAPTER 2 – Future oil demand and supply

Projections of world oil production and consumption

The International Energy Agency (IEA), in its *World Energy Outlook 2005*, predicts that in a 'reference scenario' world demand for oil will grow from 82 million barrels per day in 2004 to 92 millions barrels per day in 2010 and 115 million barrels per day in 2030 – an average growth rate of 1.3 per cent per year over the period. [2.30]

It assumes that most of the increased demand for oil to 2030 will be supplied by a large increase in OPEC production, particularly in the Middle East. [2.32]

The IEA argued that resources are adequate to meet projected demand, although 'reserves will need to be "proved up" in order to avoid a peak in production before the end of the projection period [2030].' However it noted that financing the investment needed to find and exploit the resources is a serious challenge. [2.31]

The core document used to support the assumption that oil supply will not be constrained before 2030 appears to be the US Geological Survey's *World Petroleum Assessment 2000* (USGS 2000). This estimated that the world's total conventional oil and natural gas liquids produced to 1995, or with potential to be added to reserves between 1995 and 2025, is about 3,345 billion barrels. Of this about 1,000 billion barrels has already been produced. [2.35]

Oil production and consumption in Australia

Australia's demand for petroleum is over 750,000 barrels per day. This is projected to rise to over 800,000 barrels per day by 2009-10, and over 1,200,000 barrels per day by 2029-2030. [2.43]

Australia's net self-sufficiency in oil is expected to decline significantly as future discoveries are not expected to make up for the growth in demand and the decline in reserves as oil is produced. [2.48]

CHAPTER 3 – 'Peak oil' concerns about future oil supply

'Peak oil' commentators commonly predict a peak of conventional oil production somewhere between now and 2030. They fear that declining production after the peak will cause serious hardship if mitigating action is not started soon enough. [3.3]

'Peak oil' commentators mostly estimate an ultimately recoverable resource (total production past and future) of conventional oil much lower than official agencies such as the US Geological Survey. This affects the timing of the peak as the rate of production should be expected to peak when about half the ultimately recoverable resource has been produced. [3.17, 3.73]

The main areas of disagreement are:

- Estimates of current reserves: Peak oil commentators argue that estimates of remaining reserves are unreliable and probably overstated, particularly in the Middle East. [3.19]
- Estimates of future reserve growth: 'Reserve growth' is the commonly seen increase in the estimated reserves of already discovered oilfields over time. USGS 2000 estimated future world reserve growth by analogy with past reserve growth in the United States. Peak oil commentators argue that this is unsound, since US reserve growth has been enlarged by factors which do not apply worldwide or will not apply as much in future. [3.25, 3.27, 3.31]
- Estimates of future oil discoveries: New field oil discoveries have declined greatly since the 1960s. USGS 2000 estimates of future discoveries, to be realised, would require a drastic turnaround of this declining trend. Peak oil commentators argue that the declining trend of oil discovery reflects geological fundamentals and should be expected to continue. [3.38, 3.40, 3.52]

Estimating the timing of peak oil

The timing of peak oil is debated. However the concept appears to be well accepted including by official agencies. [3.88]

The US Energy Information Administration in 2000 estimated a peak between 2020 and 2050 depending on assumptions about demand growth and the size of the ultimately recoverable resource. In a similar exercise the International Energy Agency (IEA) in 2004 estimated a peak of conventional oil production between 2013 and 2037 depending on assumptions. Many commentators predict an earlier peak. [3.79, 3.82, 3.86]

The US Energy Information Administration study found that widely differing estimates of the ultimately recoverable resource (URR) make surprisingly little difference to the timing of the peak. The exponential growth of demand is the dominating factor. [3.83]

From this it follows that an optimistic view of long term oil supply cannot rely only on a high estimate of the URR. It must rely on an optimistic view of the ability of market forces and technological progress to bring alternative fuels on stream in a timely way in sufficient quantity to serve the post (conventional) oil age. [3.90]

Investment needed to maintain production

The upstream developments needed to offset depletion of existing oilfields and to supply demand growth will require very significant investment. The IEA's recent World Energy Outlooks have stressed that there is no guarantee that this will be forthcoming. [3.94]

The prospects of nonconventional oil

All scenarios for future oil production assume increased exploitation of nonconventional oil (heavy oil, tar sands, shale oil) to offset declining conventional oil. Peak oil commentators argue that large scale exploitation of these resources will be too difficult and costly to make much difference to the peak oil problems which they predict. [3.99, 3.105]

The IEA notes that 'producing such a massive amount of resources can only be done over long periods of time… simply mobilising the capital… is likely to take several decades.' [3.107]

Implications for the price of oil

Demand for oil is relatively inelastic, because for its major use – transport – there are no easy substitutes. This means that a relatively small shortfall in supply can cause a large increase in price. This will increase the volatility of the price in response to small changes in supply when there is little spare capacity. [3.114]

The IEA now expects that the price of crude oil will ease to about US$47 per barrel by 2012, thein increase to US$55 by 2030 (2005 dollars). Prices are likely to remain volatile. Some commentators believe that much higher prices are possible. [3.112, 3.117]

New warnings in the World Energy Outlook 2006

The IEA's *World Energy Outlook 2006* (WEO 2006) gives serious new warnings about the energy future. It regards current trends as 'neither secure nor sustainable'. It stresses the need for energy policy to be consistent with environmental goals – chiefly, the need to reduce greenhouse gas emissions. [3.121, 3.122]

The WEO 2006 proposes an 'alternative policy scenario' to reduce the growth of energy use and greenhouse gas emissions. A key finding is that energy saving measures reduce the total investment required to meet the demand for energy services. [3.125, 3.128]

Committee comment on peak oil concerns

The essence of the peak oil problem is risk management. The risks involved are high if peak oil comes earlier than expected, or if economies cannot adapt quickly enough to the post peak decline. Australian governments need better information from which to decide a prudent response to the risk. [3.135]

Recommendation 1 (paragraph 3.136)

The committee recommends that Geoscience Australia and ABARE reassess both the official estimates of future oil supply and the 'early peak' arguments and report to the Government on the probabilities and risks involved.

The committee considers that more needs to be done to reduce Australia's oil dependency in the long term. This is desirable not only because of peak oil concerns, but also for other reasons – to mitigate greenhouse gas emissions; to mitigate the costs of the expected long term decline in Australia's net oil self-sufficiency; and to mitigate the risks of supply disruptions as oil production becomes concentrated in a declining number of major oil-producing countries, some of which are politically unstable. [3.144]

Recommendation 2 (paragraph 3.145)

The committee recommends that in considering a less oil dependent policy scenario, the Government take into account the concerns expressed in the *World Energy Outlook 2006*, namely -

• current trends in energy consumption are neither secure nor sustainable;

• energy policy needs to be consistent with environmental goals, particularly the need to do more to reduce fossil fuel carbon dioxide emissions.

CHAPTER 4 – Economic and social impacts of possible higher fuel prices

The general impact of a long term higher oil price would be reduced economic growth. A price increase transfers income from oil-consuming to oil-producing nations, and the net economic effect is negative. [4.11]

Industries in which fuel is a higher proportion of input costs will be relatively more affected. These include transport (particularly aviation), mining and agriculture. [4.30-4.35]

Among consumers, higher fuel prices are likely to have most effect on those who are highly reliant on car transport and lack alternatives. These people tend to be outer suburban residents and rural and regional communities. [4.36]

The expected future concentration of oil production in fewer countries increases the risk of disruptions to supply. [4.46]

CHAPTER 5 – Supply side responses: overview and exploration

Oil exploration in Australia

Australia's self-sufficiency in oil is expected to decline into the long term as reserves are depleted and because of rising demand. It appears prudent to encourage oil exploration. [5.5, 5.7]

By world standards Australia's sedimentary basins have been only lightly explored. However opinions differ about the prospects of finding significant quantities of new oil. [5.8, 5.12, 5.13]

Current exploration activity is not high by historical standards, because of exploration costs and risks; uncertainty about the longer term price of oil; and policy settings including taxation regimes and incentives. On 14 August 2006 the Prime Minister announced a number of initiatives to stimulate exploration. [5.18, 5.19, 5.30]

There are reasonable grounds to believe that there are good prospects for discovering further reserves. However a multifaceted approach to reduce dependence on imported oil is still necessary. [5.33]

CHAPTER 6 – Alternative fuels from gas, coal and shale

Gaseous fuels: natural gas, LPG and hydrogen

Natural gas as a vehicle fuel has advantages and disadvantages. Advantages include its ready availability and claimed lower emissions. Disadvantages include the size and weight of storage tanks, the limited range of vehicles; the energy cost of compressing or liquefying the gas; the lack of refuelling infrastructure; and doubt about the long term gas price. [6.28, 6.29, 6.36]

The claimed environmental advantages of natural gas are not completely clear. Greenhouse gas emissions in use are lower than petrol or diesel; however on a 'well to wheels' basis the advantage may be reduced or neutralised by the energy cost of compressing or liquefying the gas; the unintended leakage of methane (which is a powerful greenhouse gas); and by release of carbon dioxide which is found in natural gas reservoirs. [6.65-6.67]

Australia is the world's largest per capita user of automotive LPG, and the number of LPG vehicles is increasing, encouraged by recently established government subsidies. LPG is superior to regular petrol in greenhouse terms. However there are some doubts about the long term adequacy of supply, depending on what proportion of the vehicle fleet is converted. [6.76, 6.83, 6.90]

Hydrogen has been put forward as a transport fuel, however there are formidable technical challenges before it could be widely used. In the committee's view it might

be considered for the distant future, but it is not a useful option for the current or medium term. [6.93-6.95]

Synthetic fuels from gas or coal

Processes to produce liquid fuels from gas or coal are well proven. [6.96]

Gas-to-liquids (GTL) diesel is compatible with existing refuelling infrastructure and can be blended with conventional diesel. Plants have tended to be built where gas prices are low. Uncertainty about the longer term oil price seems to be holding back investment in Australia and elsewhere. [6.102-6.106]

The well to wheels greenhouse gas performance of the output liquid is debated. One study shows greenhouse emissions higher than conventional diesel, though lower than conventional petrol. [6.110-6.111]

Coal-to-liquids (CTL) is seen by some as a viable method of producing liquid fuel on a large scale in the near future. Capital costs per barrel of daily capacity are somewhat higher than for a gas-to-liquids plant. A plant currently proposed for the Latrobe Valley is estimated to cost $5 billion to produce 60,000 barrels per day, 80 per cent of which would be diesel. [6.116, 6.120, 6.123]

The output liquid has high well to wheels greenhouse gas emissions. If a charge was made for carbon dioxide emissions in future this would affect its viability. [6.121]

The CTL plant proposed for the Latrobe Valley would include carbon capture and storage. Carbon capture and storage has been demonstrated on a relatively small scale in several parts of the world, and the committee was told it is 'well on the path of being proven.' [6.126, 6.129]

It appears that there are grounds for cautious optimism that carbon capture and storage technology has good prospects for success. However, the committee also notes the comments in the recently released IEA *World Energy Outlook 2006* that carbon capture and storage has not yet been demonstrated on a commercial basis. [6.138]

Significant production of gas-to-liquids or coal-to-liquids fuel will require large capital investment and long lead times, and involve risks that are hard to manage, such as the longer term price of oil and gas. [6.135-6.136]

Oil from shale could theoretically make a significant contribution to Australia's transport fuel requirements, however there serious economic, technical and environmental obstacles to commercialising it. It is suggested that oil from shale is only viable when the long term crude oil prices reaches $US70-95 per barrel. [6.148, 6.149]

CHAPTER 7 - Supply side responses: biofuels

The government has a target of 350 million litres of biofuels production by 2010. The two most commonly discussed biofuels are ethanol and biodiesel. [7.1, 7.7]

Ethanol

Ethanol blended with petrol is widely used as a vehicle fuel in some countries. In Australia it is currently produced from sugarcane (generally using molasses), grain and grain residues. [7.15]

Some submissions argued that the availability of affordable feedstocks is a major factor limiting greater ethanol production. Production of ethanol from lignocellulose, though not yet proven on a large commercial scale, offers potential to greatly increase production and improve the energy return on energy invested. [7.17, 7.25]

E10 has fewer greenhouse gas emissions than neat petrol. The net effect on other emissions is less clear. [7.35]

The 2005 Biofuels Taskforce found that the long term oil price would need to average US$42-47 per barrel (2004 dollars) for new ethanol producers to be viable after 2015 without assistance (depending on the feedstock used). [7.44]

The main barrier to growth is the commercial risk for investors considering the uncertainty of the future price of petrol and ethanol, and current consumer resistance to ethanol. [7.51, 7.54]

The committee supports the development of a fuel ethanol industry, but notes the significant barriers that need to be overcome before it becomes a mainstream fuel. It appears that production from lignocellulose is the only realistic way to make ethanol a mainstream fuel. [7.56, 7.57]

The committee considers that there is a need to increase transparency in relation to whether biofuels targets are being met. [7.62]

Recommendation 3 (paragraph 7.63)

The Committee recommends that the Government publish the results of its review of progress made towards meeting the biofuels target of 350ML per year, including which companies are meeting the target.

Recommendation 4 (paragraph 7.64)

The committee recommends that the Government examine the adequacy of funding for lignocellulose ethanol research and demonstration facilities in Australia, and increase funding where appropriate.

Biodiesel

Biodiesel is a diesel-like fuel made by chemically modifying vegetable oils or animal fats. A limited amount of biodiesel is already produced in Australia, but it is available at only a few locations. A major challenge for increasing production is obtaining affordable feedstocks. [7.66, 7.68, 7.89]

Biodiesel has lower emissions of pollutants and greenhouse gases than conventional diesel. [7.86 - 7.88]

Recent changes to the fuel taxation system have reportedly had an adverse impact on the prospects of the industry. The Biofuels Taskforce considered that between 2010 and 2015 biodiesel is likely to become commercially unviable. [7.72]

The committee considers that biodiesel can make a small but worthwhile contribution to Australia's fuel mix. However the economics of the industry are precarious, particularly if government assistance is reduced, as is the current policy. [7.89]

Committee comments on alternative fuels in general

In relation to alternative fuels in general, the committee acknowledges that massive investment in large scale production will be essential if they are to replace conventional fuels to any significant degree. Corporations see this investment as risky. Some alternative fuels face consumer acceptance barriers. There are also long lead times associated with many of these projects. Unless risk can be quantified or controlled, investment will not be forthcoming. [7.90 – 7.93]

Recommendation 5 (paragraph 7.96)

The committee recommends that the Government commission a research group within the Department of the Treasury to identify options for addressing the financial risks faced by prospective investments in alternative fuels projects that are currently preventing such projects from proceeding. This group should determine how these risks might be best addressed in order to create a favourable investment climate for the timely development of alternative fuel industries, consistent with the principles of sustainability and security of supply.

CHAPTER 8 – Demand side responses

Increasing the fuel efficiency of vehicles

Since 1979 the fuel efficiency of light vehicle engines has improved significantly. However the efficiency of the light vehicle fleet has improved more slowly, as consumers have moved to larger, more powerful vehicles. [8.4]

A current voluntary code agreed in 2003 between government and the Federal Chamber of Automotive Industries calls on FCAI members to improve the national

average fuel consumption of new passenger cars to a target of 6.8 litres per 100km by 2010 (the actual figure in 2001 was 8.28 litres/100km). This would require a significant improvement on the trend of the decade before 2001. [8.9]

It is unclear what progress has been made to achieve this target. The committee recommends that this should be investigated. [8.12, 8.13]

Recommendation 6 (paragraph 8.21)

The committee recommends that the Government, in consultation with the car industry, investigate and report on trends in the fuel efficiency of the light vehicle fleet and progress towards the 2010 target for the fuel efficiency of new passenger cars. If progress under the present voluntary code seems unlikely to meet the target, other measures should be considered, including incentives to favour more fuel efficient cars; or a mandatory code.

Other suggestions in submissions to improve the fuel efficiency of cars include:

- measures to encourage smaller and hybrid cars, for example by adjusting registration fees to favour them;
- measures to encourage diesel cars; and
- increasing the fuel excise to encourage use of more efficient vehicles (this could be coupled with lower registration charges to be tax-neutral overall). [8.16]

Congestion charges

A congestion charge is a road use charge tailored to target the most congested times or places – for example, a cordon charge to enter a Central Business District, or a toll that varies according to the time of day. [8.29]

A congestion charge, by discouraging some users, reduces congestion. This improves fuel efficiency, as vehicles use more fuel in congested conditions. [8.29]

While the economic case for congestion charging is strong, politically is has been difficult to implement because of the perception that it is 'yet another tax on motorists'. To win public support it is important to hypothecate the revenue for transport improvements, including public transport improvements so more motorists have alternatives to their cars. [8.31]

The committee suggests that Australian governments should take a more active role in educating the public about the benefits of congestion charges. [8.34]

Recommendation 7 (paragraph 8.35)

The Committee recommends that Australian governments investigate the advantages and disadvantages of congestion charges, noting that the idea may be

more politically acceptable if revenue is hypothecated to public transport improvements (as has been done in London, for example).

Encouraging walking, cycling and public transport in cities

Many submissions argued for increased use of walking, cycling and public transport as a way of reducing transport fuel use. Ambitious goals for increasing the public transport mode share are commonly seen in official plans. [8.36, 8.39]

Many submissions urged the Commonwealth to be more involved in improving urban public transport infrastructure, as happens in many other federal countries. The Commonwealth's policy is that public transport is the responsibility of the states. [8.39, 8.41]

However the Commonwealth has supported 'Travelsmart' projects through the Greenhouse Gas Abatement Programme. Travelsmart aims to reduce car use by direct approach to targeted households (for example, to give information about public transport services). This can be a very cost effective, and the committee recommends that Commonwealth support should continue. [8.42, 8.55]

Recommendation 8 (paragraph 8.56)

The committee recommends that Commonwealth support for Travelsmart projects be maintained beyond the currently planned termination date.

The committee does not suggest that the Commonwealth should take over the States' basic responsibility to operate public transport services. However there may be a case for Commonwealth assistance to major projects such as rail extensions which are unlikely to happen, or unlikely to happen soon enough, without the involvement of the bigger budget which the Commonwealth commands. [8.53]

Integrating transport planning and land use planning

Car-dominated transport habits reflect patterns of urban development which make high car use necessary. Submissions stressed that turning around this situation requires better public transport and planning policies to shape urban development so that public transport networks can work efficiently and attract more 'choice' customers. [8.57, 8.61]

Urban strategic planning is the responsibility of State and Territory governments. The needed initiatives involve state and local governments. The right institutional arrangements and powers are needed to ensure that the planning and the execution are coherent. [8.67]

More use of rail for long distance freight

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. [8.71]

Commonwealth policy recognises that the rail system has been under funded 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. The Commonwealth has committed $2.4 billion to rail improvements over the five years to 2008-2009, mostly for the Melbourne-Sydney-Brisbane corridor. [8.75]

If there is a long term rise in the price of fuel, this will favour rail, because fuel is a greater proportion of total costs for road transport. This may suggest a need to increase the pace of catch-up investment in rail infrastructure. Auslink corridor strategies should allow for this. [8.77]

Recommendation 9 (paragraph 8.78)

The committee recommends that corridor strategy planning take into account the goal of reducing oil dependence as noted in recommendation 2. Existing Auslink corridor strategies should be reviewed accordingly.

Fringe benefits taxation of employer-provided cars

Many submissions argued that the concessionary tax treatment of cars as a fringe benefit should be abolished, on the grounds that

- it encourages car use and undesirably distorts economic behaviour;
- as a way of assisting the Australian car industry it is poorly targeted, as now only 29 per cent of new cars are Australian made. [8.82, 8.87]

The concession arises because the statutory formula which most people use to calculate the tax obligation overestimates the amount of business use of the cars in question – thus, some private use is untaxed. [8.84]

The committee notes that the Council of Australian Governments (COAG) is now considering options for managing urban traffic congestion. The committee suggests that this should include the Commonwealth reconsidering the policy behind the concessionary fringe benefits taxation of cars. [8.91]

Recommendation 10 (paragraph 8.94)

The Committee recommends that the government review the statutory formula in relation to fringe benefits taxation of employer-provided cars to address perverse incentives for more car use.

It should be stressed that the question of whether the tax should be concessionary is different from the question of minimising compliance costs. A statutory formula method can be retained for the sake of easy compliance, while the concessionary aspect can be removed by adjusting the rates. [8.95]