Chapter Seven

Supply side responses – Alternative fuels – Biofuels

Introduction

7.1 In Australia, the two biofuels that are commonly discussed as alternatives or supplements to conventional oil are ethanol and biodiesel. While these two fuels are the most commonly discussed in Australia, it should be noted that it is possible to produce a range of other possible fuels, for example synthetic diesels, methanol and DME, and there are research and demonstration projects in progress in a number of countries in relation to these fuels. This section of the report concentrates principally on the two mainstream biofuels, ethanol and biodiesel.

7.2 The report of the Biofuels Taskforce to the Prime Minister (August 2005), provides a reference point for all consideration of biofuels in the Australian transport fuels mix.

7.3 The terms of reference for the taskforce asked it to:

> … examine the latest scientific evidence on the impacts of ethanol and other biofuel use on human health, environmental outcomes and automotive operations; and
>
> On this basis, and taking into account the most recent economic analyses of fuel supply in Australia, assess the costs and benefits of biofuel production.[1]

7.4 The Taskforce was asked to examine:

- the findings of the December 2003 desktop study by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Australian Bureau of Agricultural and Resource Economics (ABARE) and the Bureau of Transport and Regional Economics (BTRE) into the appropriateness of a 350 million litre (megalitre, ML) biofuels target;
- the findings of the Department of the Environment and Heritage study into the impacts of 10% ethanol (E10) and 20% ethanol (E20) on engine operation;
- other international and Australian scientific research on the health and environmental impacts of supplementing fossil fuels with oxygenates such as ethanol and other biofuel blends; and

---

1 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005.

- the economic and scientific bases upon which decisions have been made to support ethanol and other biofuel production in North America, Europe and other countries.

7.5 The committee regards this report as the current benchmark for all consideration of the possibilities of biofuels, and necessarily draws on it heavily throughout this section of the report.

Government initiatives in relation to developing a biofuels industry

7.6 The committee notes a number of government initiatives intended to contribute to the development of a biofuels industry. These include:

- the payment of production grants of 38.143 cents per litre (cpl) for fuel ethanol and biodiesel. These arrangements ensure that the effective rate of excise for biofuels is zero until 1 July 2011;
- capital grants for projects that provide new or expanded biofuels production capacity;
- a 50 per cent discount to alternative fuels entering the excise net under the recent reforms to the fuel excise system; and
- the establishment of the Ethanol Distribution Program, to commence from 1 October 2006. This program provides grants to encourage the development of facilities at services stations to sell ethanol blended petrol.[2]

Biofuels target

7.7 The committee notes that the Government has announced a Biofuels Target of 350 ML per year by 2010. This is about 6,000 barrels per day, which would be about 0.75 per cent of Australia's expected oil consumption by 2010 of 800,000 barrels per day.

7.8 Several submissions considered that this target was inadequate. CSR Ltd agreed that it was 'a start' but submitted that it was 'but a drop in the ocean', arguing that Australia needs to give serious consideration to how future transport fuel requirements will be met under a peaking oil scenario.[3]

7.9 Similarly, the Queensland Government, which urges the expanded use of alternative fuels in the Australian fuel market, including the range of fuels discussed elsewhere in this report as well as biofuels, maintained that the current target 'is not sufficient to stimulate large scale production and guarantee the future of the biofuels

---

2 Department of Industry, Tourism and Resources, *Government Biofuels Initiatives*, at http://www.industry.gov.au/content/itrinternet/cmscontent.cfm?objectID=A9D9A207-0351-51FB-F20C287758203878, accessed 24 November 2006.

3 CSR Ltd, *Submission 148*.

industry'. The Queensland Government submitted that planned ethanol production in Queensland alone would account for the whole biofuels target.[4]

7.10 The Biofuels Taskforce considered that on current settings and consumer demand that it was unlikely that the 350 ML biofuels target would be met. The Taskforce held this view for a number of reasons, including an absence of consumer demand for ethanol blends and a lack of consumer confidence in the fuel; and commercial risk considerations for potential producers that are difficult to overcome.[5]

7.11 A number of submissions confirmed the Biofuels Taskforce assessment of a poor perception of ethanol by consumers. For example, the Australian Cane Growers' Council (ACGC) attributed this poor perception to media reporting of alleged vehicle damage caused by high percentage ethanol blends of up to 30 per cent. The ACGC noted that none of these allegations were ever substantiated.[6] Clearly however, overcoming this poor perception and indeed resistance to ethanol as a fuel, is a major obstacle to its wider adoption.

Why biofuels?

7.12 The arguments that are put forward for developing a more extensive biofuels industry that can make a significant contribution to Australia's transport fuel requirements have much in common with those advanced in relation to other alternative fuels. These include:

- energy security - biofuels are advanced as a means of supplementing fuel supplies if and when conventional petroleum supplies become constrained, and making Australia less dependent on imported oil;
- economic reasons, reducing the impact of oil imports on the future balance of payments;
- adding value to low value products; and
- for environmental reasons, biofuels being claimed to result in much lower greenhouse gas emissions as well as other atmospheric pollutants.

7.13 Regional development and employment benefits are also frequently advanced as reasons for supporting the development of a biofuels industry. For example, the ACGC submitted that:

> An ethanol industry, adding to the range of value adding opportunities for crops such as grains and sugar, would strengthen regional economies and provide additional employment. Each plant could create around 30 new

4 Queensland Government, *Submission 155*, p. 7.

5 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, pp 1 and 3.

6 Australian Canegrowers' Council, *Submission 36*, p. 3.

> permanent jobs and generate investment spending of around $80 million and operational spending of around $20 million a year.[7]

7.14 Similarly, the WA Farmers' Federation linked the establishment of ethanol and biodiesel to the opening up of other regional industries:

> The other side of a biofuels industry is that if you go to grain alcohol—we produce plenty of grain—and use canola to produce biodiesel, that opens up the ability for the agricultural areas to develop feed-lotting industries. Western Australia does not have the amount of feed lotting you do on the eastern seaboard. That would allow farmers an extra outlet for their grain. At the moment, we are highly export dependent and, from a social impact perspective, we would really appreciate some more inland industries. That is another industry that could be positioned inland. That is value added.[8]

Ethanol

7.15 Ethanol is used extensively as a fuel in some countries. Brazil, which mandates the use of 22-26 per cent ethanol - petrol blend, is the leading user of fuel ethanol, and it is also reasonably widely used in the United States. In Brazil, 70 per cent of new vehicle sales are 'flexi-fuel'.[9] Ethanol is currently produced in Australia from either sugarcane, generally using molasses as a feedstock, and from grain and grain residues.

7.16 Ethanol's use as a fuel in Australia is small scale. There is a statutory limit of 10 per cent by volume, introduced in 2003. It is now available in Australia as a petrol blend in some locations, most visibly marketed by BP Australia. A number of independent petrol retailers also sell ethanol blends, and Shell's premium fuel (now marketed as Shell V-power Racing) contains 5 per cent ethanol.

7.17 Several contributors to the inquiry questioned whether it is possible for ethanol to make a significant contribution to the fuels mix, arguing that the availability of competitively priced feedstocks which would allow ethanol to be produced at a price competitive with conventional fuels is a major limiting factor.

7.18 For example, Mr Brian Fleay submitted that:

> … the energy content of anhydrous ethanol from sugar and wheat would be a small fraction of the energy content of annual consumption of petroleum-based fuels, especially in drought years. While anhydrous ethanol from biomass is technically viable as a transport fuel it cannot be produced on a scale that replaces current petroleum products. Similar limits would apply

---

7 Australian Canegrowers' Council, *Submission 36*, p. 8.

8 Committee Hansard, 12 April 2006, p. 95. (Mr DeLandgrafft)

9 Australian Canegrowers' Council, *Submission 36*, p. 2. Flexi fuel vehicles are designed to operate on a range of different ethanol blends, ranging from 0 to 85 per cent. They are available in Brazil, the United States, Sweden and the United Kingdom.

> to biodiesel. It is not remotely possible to divert much of these agricultural products to fuel production at the expense of food supply.[10]

7.19 The Australian Cane Growers' Council (ACGC), which argues for the wider use of this fuel, said that it was nonetheless possible to meet a relatively modest target. The ACGC submitted that it would be possible to produce enough ethanol using grains and molasses to meet a mandated target of 2 per cent ethanol in petrol, and that a higher 10 per cent target could be met but would require the diversion of higher value sugar products and grains.[11]

7.20 Similarly, CSR also suggested that it should be possible, but acknowledged that some feedstocks are either too valuable in their own right or impractical to use for ethanol production. CSR pointed to sorghum and wheat as the most likely economic feedstocks, concluding that a higher target could be met:

> Overall it would not be unrealistic to foresee sufficient bioethanol to satisfy a 10% national average blend from domestic production.[12]

7.21 The Biofuels Taskforce reported that proposed ethanol projects other than those of the three current commercial producers (Manildra, CSR and Rocky Point Sugar Mill) could theoretically increase ethanol production to 1,005ML by 2010.[13] This falls short of the quantity required to meet a 10 per cent ethanol target.

7.22 However, whether these levels of production could be attained reliably using grain or sugar by-products appears doubtful. The committee notes media reports that Australia will, for the first time in ten years, import grain to offset a national wheat shortage due to crop failure and will have to buy wheat on the international market to honour export contracts.[14]

7.23 Questions were also raised during the inquiry about whether the energy return on investment from ethanol was sufficient to justify the investment in its production, at least using current technology. For example, according to Emergent Futures, the most recent analysis of grain based ethanol has the farm to tank process producing only 1.36 units of energy for every 1 unit of fossil fuel energy used up.[15] Others have claimed that the return can be even lower.

7.24 A submission from Drs Hongwei Wu and Mike Ewing said that an analysis conducted by Dr Wu showed the return on corn-to-ethanol can be as little as 1.0.[16]

---

10 Mr Brian Fleay, *Submission 74*, Appendix 5.

11 Australian Cane Growers Council, *Submission 36*, p. 5.

12 CSR Ltd, *Submission 148*, p. 6.

13 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, pp 1 and 38.

14 Article published in Sydney Morning Herald, *Wheat imports loom as drought bites*, 15 November 2006, p. 3.

15 Emergent Futures, *Submission 117*, p. 21.

16 Dr Hongwei Wu and Dr Mike Ewing, *Submission 179*, p. 3.

These figures are disputed by some commentators. For example, the ACGC said that a review it had commissioned showed a return of up to 50 per cent (ie: return of 1.5); and that Brazilian studies showed a return of 8 to 1.[17]

7.25 Production of ethanol from cellulose (or lignocellulose), while not yet proven on a large commercial scale, offers the potential to greatly increase ethanol production and improve the return on energy invested.

7.26 This technology, which is the subject of considerable research both in this country and overseas, seeks to break down the cellulose portions of plants into a form that can then be fermented to produce ethanol. It opens up the possibility of a much larger feedstock becoming available, increasing potential productive capacity. 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 per cent of the Australia's oil consumption.[18]

7.27 Microbiogen specialises in the development of yeasts that can digest a portion of plants that are currently impossible to ferment, hemicellulose (xylose). Dr Bell, the Manager of Research and Development of Microbiogen, told the committee that the company believed they were about 18 months from achieving their alcohol yield goals. Like a number of others, Dr Bell said that the lack of a market for ethanol, the inability to guarantee sales, is one of the principal factors holding back development of ethanol as a transport fuel.[19]

7.28 On the possibilities offered by lignocellulose ethanol, the Biofuels Taskforce had this to say:

> A new generation of technology offers the prospect of producing biofuels competitively and from more readily available lignocellulosic feedstocks such as wheat straw, grasses and wood waste. Given these prospects, and the International Energy Agency's (IEA) forecasts for a significant and continuing increase in global demand for biofuels, there would be value in a closer examination of this technology as a platform for a potential new industry for Australia.
>
> In addition, the Taskforce suggests that, given the potential for lignocellulosic ethanol to impact materially on the economics of the biofuels industry in the coming decade, further policy interventions based on current industry technologies and feedstocks should be limited, without a close assessment of the potential impact of ethanol made from lignocellulose.

7.29 The Taskforce concluded:

---

17 ACGC, *Submission 36*, p. 8.

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

19 *Committee Hansard*, 30 June 2006, pp 88-9.

> The Taskforce notes the potential for lignocellulosic ethanol technology to impact materially on the economics of the ethanol industry in the coming decade. Policy interventions based on current industry technologies and feedstocks should be limited without further assessment of the impact of lignocellulosic technology.[20]

7.30 The Biofuels Taskforce appears to consider that ligncellulose technology has the potential to make traditional ethanol technologies based on sugar by-products and grain redundant, hence its warning to 'consider carefully' new policy interventions to assist investment in production from current technology. The committee shares the Taskforce's views on this issue.

7.31 Techniques for producing ethanol using cellulose[21] are also claimed to achieve a much better energy return on energy invested than grain based ethanol. For example, Emergent Futures submitted that such techniques can produce up to 10 units of energy for every unit of fossil fuel energy used up[22] and the submission from Drs Hongwei Wu and Mike Ewing said that when based on mallee, the return on a fifty year cycle was 41.7.[23]

7.32 The question arises then as to whether lignocellulose is 'five to ten years away', or whether it is near-term. Microbiogen submitted that:

> The two challenges to commercialization of the lignocellulose to ethanol industry are being overcome and suggest the industry will be viable within 2 - 3 years.[24]

7.33 The committee notes that a Canadian company, Iogen Corporation, has signed an agreement with Petro-Canada to build a demonstration cellulose ethanol plant. This plant is expected to cost $C30 million and is expected to produce 3-4ML annually.[25] Iogen, Shell and Volkswagen have also signed a letter of intent to investigate the feasibility of establishing a lignocellulose ethanol factory in Germany.[26]

7.34 In an article published in Australian Forest Grower, Mr Alan Cummine claimed that an Australian company, Apace Research Ltd, had developed a version of

---

20 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, pp 1 and 15.

21 Two possible routes are available – fermentation or gasification.

22 Emergent Futures, *Submission 117*, p. 21.

23 Dr Hongwei Wu and Dr Mike Ewing, *Submission 179*, p. 3.

24 Microbiogen, *Submission 92*, p. 5.

25 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, pp 1 and 44.

26 http://www.iogen.ca/key-mesages/overview/m4-fuels-vehicles.html, accessed 9 November 2006.

this technology to the pilot plant phase in the 1990s, and that the plant was 'still awaiting adequate government and industry support' to demonstrate the process.[27]

Environmental impacts of ethanol as a transport fuel

7.35 There are two key criteria against which the environmental performance of ethanol used as a transport fuel can be assessed. These are effects on air quality; and greenhouse gas impacts. The Biofuels Taskforce report sums up the state of knowledge on the effect on non-CO2 emissions that affect air quality as follows:

- There is considerable uncertainty about effects of fuel ethanol on air quality. Prima facie evidence exists that E10 may significantly reduce fine particulate emissions.
- More smog-chamber research is needed to understand properly the effect of adding ethanol to petrol on secondary organic aerosol formation.
- Emissions of CO are reduced under E10 compared with neat petrol, there is little change in volatile organic compounds emissions, and NO_x emissions are increased.
- The impact on air toxic levels in the atmosphere from the use of E10, relative to petrol, is difficult to assess. Combustion of E10 results in lower tailpipe emissions of some toxic compounds (e.g. benzene and 1,3 butadiene), but higher levels of others (e.g. the aldehydes).[28]

7.36 The Taskforce considered that a properly designed Australian in-service vehicle emission (tailpipe and evaporative) study, combined with an air quality monitoring programme and including health risk assessment, would be required to assess the air quality impacts of biofuels more effectively. It also considered that there is a need to carry out extensive experimental work to evaluate the impact of E10 and E5 on particulate emissions from petrol vehicles under Australian conditions. Further, the Taskforce considered that more smog-chamber research is needed to understand properly the effect of adding ethanol to petrol on secondary organic aerosol formation.[29]

7.37 The use of ethanol as a transport fuel is also claimed to have significant greenhouse gas benefits. Whether this is the case will depend on the source of the ethanol, whether its production processes result in a positive or negative energy return on the energy invested in the production process, and the proportion of ethanol used in the fuel mix.

---

27 Alan Cummine, *Ethanol history being ignored at our cost*, Australian Forest Grower, Autumn 2003.

28 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, pp 1 and 69.

29 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, pp 1 and 69.

7.38 According to the Biofuels Taskforce report, savings from E10 in greenhouse gas emissions over neat petrol are generally from 1 per cent to 4 per cent , depending on feedstock. It noted that a recent life-cycle analysis for a proposed ethanol plant has suggested that savings of between 7 per cent and 11.5 per cent can be achieved with optimum use of non-ethanol co-products.

7.39 Other publications make more extensive claims in relation to the CO2 benefits. For example, the Iogen Corporation compares the CO2 emissions of a Toyota Prius hybrid vehicle running on conventional petrol, and producing 115g of CO2 per kilometre, with those of a Ford Focus (a 4 cylinder small car of comparable size) flexible fuel vehicle operating on cellulose E-85. The Focus produces less than half the CO2 of the Prius, 40g per kilometre. Iogen concludes that:

> Running any of the many flexible fuels vehicles on cellulose ethanol e85 is one of the most cost effective ways to reduce greenhouse gas emissions in transport.[30]

Economics of ethanol as a transport fuel

7.40 The oil price at which ethanol is competitive with conventional petrol will vary widely according to the level of government assistance by way of producer grants and excise concessions, the exchange rate, the cost of feedstocks, the efficiency of production processes and the technology employed.

7.41 Information provided by the ACGC indicated that ethanol could be produced from conventional sources (grain, molasses) for between 60 and 70 cents per litre. This could rise to between 75 and 80 cents if higher value feedstocks were used. The ACGC cautioned that these were indicative costs only.[31]

7.42 The ACGC provided the committee with useful information about the price competitiveness of ethanol at different oil prices, and with the effect of changing excise regimes built in. These showed that ethanol can compete with petrol on price at $US50 per barrel of crude oil and at an exchange rate of $US0.75/$AUD. However, this picture changes when the long-run oil price predictions are taken into account and the Government's excise changes come into effect.

7.43 The ACGC said that at a long run oil price of $35 and exchange rate of 65 cents, the current excise regime 'may provide opportunities for ethanol production from grains and molasses, but would make production from sugar streams marginal.' When the excise changes come into effect, ethanol from grain and molasses may be in a 'reasonably competitive position' but other feedstocks would be uneconomic. The ACGC pointed out that domestic ethanol producers would have to compete on equal

---

30 http://www.iogen.ca/key-mesages/overview/m4-fuels-vehicles.html, accessed 9 November 2006.

31 ACGC, *Submission 36*, pp 4-5.

terms with imports from 2011, which would make capital investment in production facilities difficult.[32]

7.44 The ACGC's views corroborate reasonably well with the views of the Biofuels Taskforce:

> At a long-term exchange rate of US65c, the long-term world price of oil (West Texas Intermediate) would need to average US$42-47/bbl in 2004 dollars (depending on the feedstock used) for new ethanol producers to be viable post-2015 without assistance.[33]

7.45 In relation to lignocellulosic production, it is difficult to predict the price at which a full size commercial plant could produce ethanol. Drs Wu and Ewing cited an Enecon 2002 study which indicated that current cellulosic ethanol production could produce ethanol for 82 cents per litre in a 200ML plant, with a woody feedstock cost of $30/green tonne delivered.[34]

7.46 Consideration of the economics of ethanol production also requires examination of the effects that such an industry, if adopted on a large scale, would have on competing users of feedstocks, particularly grain.

7.47 The Livestock Feedgrain Users Group (LFUG) was amongst those who raised serious concerns about a grains based ethanol industry and the impact it would have on their industry:

> We are opposed to the ongoing subsidisation of grain based ethanol in Australia; this will disadvantage our grain dependent industries, and result in the propping up of an essentially non viable industry at the expense of successful industries.
>
> …
>
> Subsidised ethanol plants may, in the short term create regional grain shortages, and force up local prices as grain has to be freighted in for livestock customers. This instability would be accentuated in drought years, and is at the heart of our opposition to ethanol subsidies.[35]

7.48 The fundamental objection of the LFUG to ethanol industry assistance is that the livestock industry is required to compete for a limited amount of grain against an industry that enjoys a subsidy. The LFUG submitted that they did not object to an ethanol industry developing, but that after 2011, it should be required to compete on its own merits, without subsidy:

> … current ethanol subsidies, in particular the ethanol excise concession, should run their course. If the ethanol industry has not responded to this

---

32 ACGC, *Submission 36*, pp 6-9.

33 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, conclusion 28, p. 18.

34 Dr Hongwei Wu and Dr Mike Ewing, *Submission 179*, p. 3.

35 Livestock Feedgrain Users Group, *Submission 55*, p. 3.

> support by 2011, and cannot compete with imported product subsequently, it is not a viable transport fuel option for Australia, at least on a large scale basis.[36]

7.49 The Biofuels Taskforce also acknowledged the potential for adverse effects on feed grain prices, and that there is the potential for costs to be imposed on other parts of the economy.[37]

7.50 Even if the ethanol industry is able to become competitive against the petrol price in its own right, and new technologies for producing it become commercially viable, increasing its attractiveness both on environmental and economic grounds, it appears that there are, nonetheless, quite significant barriers to the growth of the industry. Without this necessary growth, it will be difficult for it to make a significant contribution to the transport fuels mix.

Barriers to growth

7.51 Several of the barriers to growth of the ethanol industry have already been covered in part in this section of the report. The most significant barrier appears to be commercial risk for organisations contemplating establishing ethanol production facilities and for retailers. This risk arises at least in part out of a lack of a ready market for the product. Unlike some other countries, there is a limited market for ethanol as a fuel in Australia, and consumer resistance to using it. This is despite widespread assurances that almost all cars can use E10 without modification.

7.52 The Biofuels Taskforce addressed this issue comprehensively, explaining the nature of the 'chicken and the egg' dilemma the development of the industry faces:

> A key barrier cited by stakeholders is the high level of commercial risk associated with market entry, particularly for ethanol. Low consumer confidence in ethanol means low demand, especially with no significant price advantage to the consumer. Consequently, the oil majors are reluctant to enter off-take contracts with ethanol suppliers. Without such contracts, prospective producers cannot get investment backing. The majors also have first mover concerns—the first company making a significant commitment to E10 could be seriously disadvantaged if confidence issues are not resolved.
>
> …
>
> The Taskforce considers there are real and significant commercial risks associated with market entry, facing both fuel suppliers and biofuel producers.
>
> For the oil majors, the Taskforce considers that, at present, there is little commercial incentive for them to develop a mainstream bulk market for ethanol blend fuel and, in the absence of some form of intervention

36 Livestock Feedgrain Users Group, *Submission 55*, p. 4.

37 See conclusions 29 and 30, pp 18 and 19.

> designed to improve confidence and reduce commercial risks, there will be at best, continuation of small, trial-based marketing of fuel ethanol by the oil majors.[38]

7.53 Evidence received by the committee illustrated some of the costs and risks to fuel companies introducing ethanol into their fuel blends. For example, BP explained that getting a supply of anhydrous ethanol[39] suitable for blending required some quite counter-intuitive logistics:

> At this stage it is not cheap for us. It is low volume and the actual logistics are quite difficult. We get virtually all our product from CSR in Mackay and it has to be shipped down to Melbourne for drying and then shipped back to Brisbane. It is trucked out into sites in Brisbane and, I think, up to Mackay. A lot of it ends up about 20 miles from where it started. As you can appreciate, that is not exactly an ideal way of doing it…[40]

7.54 Similarly, Shell explained that uncertainty of price trends for both petrol and ethanol represented a risk:

> Of these, the price fluctuations of the commodities ethanol and petrol are the most difficult to manage. Future scenarios where companies are committed to ethanol blends and the ethanol price becomes more expensive than petrol represent a significant risk.

7.55 Shell also described the additional costs of selling ethanol blends:

> There are significant costs associated with the blending, distribution and sale of biofuels – particularly ethanol. Terminal costs depend on the size of installation and cover storage tanks, modified firefighting equipment, linework, pumps and gantry loading arms. Retail site costs incorporate additional tank testing (due to ethanol's propensity for water), filters and branding and signage.[41]

Committee comments on ethanol

7.56 The committee is supportive of the development of an ethanol industry in Australia, but notes the very significant barriers that need to be overcome before it becomes a mainstream fuel.

7.57 Lignocellulose ethanol production is the only realistic way that the industry can become more than a niche player. If large scale production of ethanol using a feedstock that is available in volume becomes commercially feasible in the medium

---

38 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, p. 13.

39 Ethanol produced by distillation still contains a small percentage of water which cannot be removed in the distillation process. This must be removed before blending. Ethanol with the water removed is referred to as anhydrous ethanol.

40 *Committee Hansard*, 29 June 2006, p. 37.

41 Shell Australia, *Submission 181*, p. 14.

term, and the fuel proves to have the environmental benefits claimed for it, it could make a worthwhile and sizeable contribution to Australia's transport fuel requirements.

7.58 The committee notes and agrees with the Biofuels Taskforce comment to 'consider carefully' new policy interventions to assist investment in production from current technology.

7.59 The committee does not consider that there is any point at this time in mandating a minimum percentage of ethanol in petrol. Unless lignocellulose technology becomes viable with unexpected speed, supply will not be sufficient to produce the necessary quantities of fuel.

7.60 While the Committee notes that several of the oil companies, (particularly BP and to a lesser extent, Shell) have taken some measures to introduce ethanol into some of their fuels, the committee is unconvinced that all of the companies take the biofuels target set by the government seriously.

7.61 The committee also notes the relevant comments of the Biofuels Taskforce in relation to what is stopping progress towards attaining the biofuels target:

> • Oil companies in a highly competitive market, with no forcing regulation or long term economic incentive, have no commercial reason to surrender market share to others – whether to other oil or biofuels suppliers.

and

> • Under current market conditions, and with no consumer demand, oil majors have little commercial incentive to promote ethanol blends as a bulk fuel. But without contracts for sales to oil majors, new ethanol producers cannot invest in bulk fuel ethanol production.[42]

7.62 The Committee considers that there is a need to increase transparency in relation to whether or not these targets are being met, and by whom.

Recommendation 3

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

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.**

---

42 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, p1.

7.65 The committee suggests that the Government establish a high level interdepartmental committee consisting of representatives from the Departments of Prime Minister and Cabinet, the Treasury and the Department of Industry, Tourism and Resources and other relevant agencies to closely monitor the development of this technology in Australia and overseas, and to develop both options to facilitate research in Australia into this technology, and a range of programs that could be rapidly deployed to ensure a market for the fuel develops when it is appropriate.

Biodiesel

7.66 Biodiesel is a diesel-like fuel produced by chemically modifying vegetable oils or animal fats. It may be manufactured from a range of feedstocks including waste cooking oils, oil seed oils such as canola, from palm oil and from many other oil producing plants, some suitable for human and animal consumption, and some that are unsuitable but which may be grown because of the high yield of oils that can be extracted from them.

7.67 Biodiesel may also be produced by more advanced biomass gasification processes, using the same Fischer Tropsch process used to produce synthetic diesel from gas or coal, but as far as the committee is aware, this process is not under consideration in this country at this stage (with the possible exception of using biomass mixed with coal).

7.68 A limited amount of biodiesel is produced in Australia but it is not available at the retail level, except in a small number of locations. BP plans to market a diesel blend that is formulated in part (5 per cent) from a hydrogenated tallow product. According to Gardner-Smith holdings, production has increased from 4ML in 2003-04 to 14ML in 2004-05, and was projected to be more than 150ML in 2005-06.[43]

7.69 Biodiesel can be readily blended with conventional diesel, in which case it is sold using a classification that describes the proportion of biodiesel (eg: B20), or it may be used straight (B100). Blends of 5 per cent or less are classified in Australia as diesel.

7.70 Biodiesel proponents commonly claim that it is compatible with most diesel engines, although many manufacturers will not honour engine warranties if the proportion of biodiesel exceeds B5, and some will not allow it at all. The only exception to this in the light vehicle market is Peugeot, which will permit the use of up to B30, subject to the appropriate fuel standard being met.[44]

7.71 The committee notes that a useful examination of the use of biodiesel in cars and trucks is contained in Bureau of Transport and Communications Economics, *Alternative Fuels in Australian Transport*, Information Paper No. 39, 1994, Chapter 6.

---

43 Gardner-Smith Holdings, *Submission 185*, p. 4.

44 http://www.peugeot.com.au/PEUGEOT/AU/me.get?site.home&FFFF1765

Biodiesel was also discussed comprehensively in the Report of the Biofuels Taskforce.

7.72 As in the case of ethanol, the Government has provided support to assist the new industry to develop. The support provided is described above in paragraph 7.6. A key part of this support is the payment of production grants of 38.143 cents per litre, which ensure that the effective rate of excise for biodiesel is zero until 1 July 2011. The future viability of the industry appears to be heavily dependant on continued Government support. The Biofuels Taskforce considered that between 2010 and 2015, biodiesel is likely to become commercially unviable.[45] Gardner Smith acknowledges the need for continuing Government support for the industry to survive in its submission:

> In order for the bio diesel industry to develop Gardner Smith (Holdings) Pty Limited believes it is essential for the government to play a significant role. Factors that need to be considered when assessing the viability of biofuels, … include:
>
> • government support for the industry to ensure the price of bio diesel remains competitive with more traditional petroleum and diesel; …[46]

7.73 The Queensland Farmers Federation, a biofuels proponent, comprehensively summed up the economic challenges faced by the biodiesel industry if there is no on-going support from Government:

> However, the production costs of biodiesel are such that is even further away from being economically viable than ethanol without substantial continuing subsidies or mandates. ABARE estimates that without subsidies, the estimated cost of producing biodiesel in new facilities using used cooking oil is 18c/L above, and using tallow is 24c/L above, the long-term energy equivalent benchmark price for biodiesel against petrol. To be commercially viable (and achieve a 7% return on capital) over the longer term, ABARE has identified that biodiesel produced from used cooking oil would require a fuel tax subsidy of 21c/L and tallow-based biodiesel would require a fuel tax subsidy of 32c/L in nominal terms over the longer term. These estimates compare with the current fuel tax subsidy of 19.1c/L.[47]

Effect of fuel tax changes

7.74 Recent changes to the fuel taxation system included in the *Fuel Tax Act 2006* have reportedly had an adverse impact on the prospects for the future development of the industry. These changes do not appear to have been foreseen by the industry, despite the report of the Biofuels Taskforce warning of their impact.[48] The effects of

---

45 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, p. 1.

46 Gardner-Smith Holdings, *Submission 185,* p. 11.

47 Queensland Farmers Federation, *Submission 120*, p. 18.

48 See pp 13-14 of report.

the changes were explained in evidence at a public hearing by Mr Lake of the Biodiesel Association of Australia:

> The changes to the treatment of biodiesel under the new tax excise regime mean that from 1 July 2006 there will be a severe impediment to biodiesel production. This has the effect of making biodiesel more expensive than diesel.[49]
>
> …
>
> Under the current system with the combination of the producer grant and the effect of the offset of excise, and also the energy grants credits and other schemes available for biodiesel and all other alternate fuels, the new bills which are to be enacted as of 1 July effectively reduce and wipe out the energy grants credit offset in a very short time frame. The way the tax system is evaluated effectively puts an additional 38c for all on-road and off-road applications for biodiesel. I have with me a copy of a paper… which shows the change in [balance], where biodiesel in an establishing market can be a cost benefit at the moment and, as of next month, there will be a cost penalty to adopt it. For the case of on-road applications that penalty is anywhere from about 10c. By 2015 it goes up considerably. For off-road applications it is effectively the full excise rate.[50]

7.75 Mr Humphreys of the Biodiesel Association elaborated:

> Let me give you, if I may, two examples of the impact of the changes that you rightly refer to. Let us do an on-road with a trucking company and off-road with a farming situation. Today, if a farmer buys biodiesel, he can claim the excise for that biodiesel back providing he or she does not blend greater than 49 per cent. So providing you have a fuel mix that does not exceed B49—that means 51 per cent fossil and 49 per cent biodiesel—they can claim back the full 38c on that fuel blend, as if it were classed as a diesel. As of 1 July with the legislation before parliament as currently written that disappears. They cannot claim anything back on the biodiesel as of 1 July because of an interpretation that says as of 1 July you can only have a user grant—that is, the refund of the excise—on the net tax paid. The net tax paid is actually the killer statement…[51]

7.76 The key issue for the biodiesel industry in the Fuel Tax Act changes appears to be that the payment of a producer grant under the *Energy Grants (Cleaner Fuels Scheme) Act 2004* is taken to have extinguished the fuel tax liability. This means that the purchaser of biodiesel whose producer has received a grant cannot claim a fuel tax credit.

7.77 The committee notes evidence tendered to the Senate Economics Legislation Committee during its inquiry into the then bill in the form of a quotation from a letter

---

49 *Committee Hansard*, 9 June 2006, pp 39-40.

50 *Committee Hansard*, 9 June 2006, p. 41.

51 *Committee Hansard*, 9 June 2006, p. 41.

written by the former Assistant Treasurer, the Hon. Mal Brough MP, to Dr Humphreys of the Australian Biodiesel Group:

> The cleaner fuels grant was not intended as a stimulus package for the biodiesel industry.[52]

7.78 While sympathetic to the dilemma in which the industry finds itself as a result of the fuel tax changes, the committee notes that the benefit previously enjoyed by the industry is considered by the Government to have been a loophole. Nonetheless, it serves to illustrate the relatively precarious economics of biodiesel production in Australia.

Biodiesel production in Australia

7.79 Biodiesel is currently produced in Australia from used cooking oils and animal fats (tallow). Some plants are also being built that will use imported feedstocks, mainly palm oil. Natural Fuels Australia (NFA) is currently constructing a plant in Darwin with the capability of producing 147ML of biodiesel per year.[53]

7.80 Like conventionally produced ethanol, future biodiesel production will be limited by the availability of affordable feedstocks. Unlike ethanol, for which production from cellulose looks to be on the near horizon, biodiesel does not appear to have a cost competitive alternative method of making the fuel in development.[54] It is thus dependent on oil bearing vegetable matter like seeds and palm.

7.81 Biodiesel proponents acknowledge that one of the major challenges facing the industry is obtaining enough of the right source of fats and oils. However, the Biodiesel Association (BDA) maintains that there is 'more than enough available in Australia to well exceed the current goal of 350ML...'[55]

7.82 The BDA told the committee that biodiesel production facilities planned for construction over the next two years would have a production capacity of more than 700ML/year, and that this capacity would use all of the used cooking oil collected and a large proportion of the tallow available. The BDA said that if the industry is to grow further, new sources of supply are needed.[56]

---

52 Quoted from para 3.78 of the Report of the Senate Economics Legislation Committee into the Fuel Tax Bill and a related bill, 14 June 2006.

53 Natural Fuels Australia, *Submission 95*, p. 1.

54 The committee acknowledges the possibility of producing biodiesel through gasification technology, but notes the assessment of the U.S. Energy Information Administration that biomass-to-liquids plants have high capital and operating costs, and their feedstock handling costs are especially high. Further, BTL gasifiers are significantly more expensive than those used in GTL and CTL. Source: Energy Information Administration Annual Energy Outlook 2006, p. 45.

55 See for example Biodiesel Association of Australia, *Submission 68*, p. 4.

56 Biodiesel Association of Australia, *Submission 68*, p. 4.

7.83 The BDA maintained that there are large areas of Australia that receive high rainfall, but which are unsuitable for conventional agriculture. The BDA maintains that if an area equivalent to canola currently planted could be used for producing non-food crops, up to 15 per cent of Australia's diesel requirements could be met, with a multi-billion dollar improvement in the balance of payments.

7.84 NFA also acknowledged the difficulty in obtaining feedstock, and the difficulty of competing for oil seeds that are also required to meet domestic food requirements:

> Currently, Australia has a total edible oil requirement of around 400,000 tonnes per year, which can barely be met from local seed crushing capacity. A small proportion (28,000 tonnes) is exported. The climatic and soil conditions, plus the lack of copious water supply in most parts of the country, seem to work against the agronomy of high oil bearing seed crops. The advent of new varieties and more research might change this in time, but for the moment, biodiesel producers will have to look to imports to help satisfy their needs.[57]

7.85 Gardner-Smith also submitted that it would be necessary to import fats and oils to supplement the domestic supply, as an 'interim measure'. These imports would be palm oil and soya oil. The use of such oils has been a cause for concern by some commentators, because of the possibility of tropical forests being turned into palm oil plantations, and the displacement of crops otherwise intended for human and animal food. Both RFA and Gardner-Smith were somewhat defensive about this, advising the committee that they are members for the Roundtable for Sustainable Palm Oil, and the Roundtable on Responsible Soy.[58]

Environmental implications of biodiesel use

7.86 Biodiesel is claimed to be an environmentally benign fuel, particularly in relation to reduced greenhouse gas emissions. One of its major advantages is that it is wholly biodegradable. According to Gardner-Smith, it has particular applications in the marine industries, as spills have no environmental effects because the fuel is wholly biodegradable.[59]

7.87 The fuel also results in significantly lower emissions of most pollutants except NOx. The committee notes the conclusion of the Biofuels Taskforce in relation to air pollutants:

> **Conclusion 18:** The benefits of the 5% biodiesel blend (B5) diminish against increasingly lower sulphur diesel, with PM [ie particulate matter] emissions even increasing slightly over XLSD [extra low sulphur diesel] (to be introduced in 2009). However, on life-cycle analysis, pure biodiesel

57 Natural Fuels Australia, *Submission 95*, p. 2.

58 Gardner-Smith Holdings, *Submission 185*, p. 4.

59 Gardner-Smith Holdings, *Submission 185*, p. 4.

> (B100) has significant benefits over XLSD for CO, VOC [non-methane volatile organic compounds] and PM (especially with waste cooking oil as the feedstock), but NOx emissions increase by between 16% and 30%.[60]

7.88 Biodiesel is also acknowledged as associated with lower greenhouse gas emissions than conventional diesel. The extent of the benefit varies according to the blend used, and also the feedstock. Some feedstocks (eg canola) are associated with significant CO2 emissions during the production process, and a full life cycle analysis is needed to give the true picture of these emission levels. Nonetheless, the Biofuels Taskforce concluded that there were benefits:

> **Conclusion 19:** On life-cycle analyses, B100 from waste cooking oil produces 90% less greenhouse gas emissions than XLSD. Biodiesel from tallow or canola reduces emissions by 23% and 29%, respectively. There are negligible benefits for canola or tallow derived B5 against XLSD, though waste cooking oil achieves a 3% reduction.[61]

Committee comments on biodiesel

7.89 The committee considers that biodiesel can make a small scale but worthwhile contribution to Australia's fuel mix. In the absence of the development of a biodiesel equivalent to lignocellulose technology, the industry will be limited by the availability and price of feedstocks. There are significant environmental benefits associated with its use, but the economics of the industry are at best precarious, particularly if government assistance is reduced, as is the current policy.

Committee comments on alternative fuels in general

7.90 If alternative transport fuels are to successfully replace or supplement conventional oil to any significant degree, massive investment in large scale production will be essential, regardless of whether these fuels are to be derived from biomass or fossil sources.

7.91 This investment is seen as risky by corporations contemplating development of alternative fuel industries, for a number of reasons. All are more expensive than conventional oil, and thus the long term oil price constitutes a source of risk. Some technologies face uncertainties about the price of feedstocks and the price of carbon. (This will affect the economics of processes such as CTL that create significant emissions in the conversion process) Some such as fuel ethanol face difficulties associated with consumer acceptance and marketing the product. In the absence of

---

60 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, p. 86.

61 Australian Government Biofuels Taskforce, *Report of the Biofuels Taskforce to the Prime Minister*, August 2005, p. 89.

mandatory targets, there is little incentive for the oil companies to sell these fuels, even if available in quantity.

7.92 Additionally, all large scale projects involve long lead times before they attain production. In the case of some projects which the committee has discussed in the preceding chapters, these lead times can be ten years or more. This adds to the risk profile for prospective investment.

7.93 Unless companies can control or quantify the nature of the investment risks they face, investment will not be forthcoming. As has been seen in the case of failed GTL projects in Western Australia, it is difficult to get projects to a point where they are judged sufficiently commercially viable. Equally, there are anecdotal reports of investment in ethanol production being held up because of difficulties in finding a market.

7.94 The committee considers that there is a need for the Government to develop strategies for addressing the risks that prospective investors in new fuel technologies face, to ensure that timely investment occurs. As noted at paragraph 6.136, there are serious questions about whether market forces will operate in a way that will ensure the timely development of such projects.

7.95 The committee further considers that the issues of long term sustainability of alternative fuels must be addressed, particularly from the perspective of climate change.

Recommendation 5

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.**