



COMMONWEALTH OF AUSTRALIA

## Official Committee Hansard

# HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON INDUSTRY, SCIENCE  
AND RESOURCES

**Reference: Inquiry into increasing value-adding to Australian raw  
materials**

MONDAY, 22 NOVEMBER 1999

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**HOUSE OF REPRESENTATIVES**  
**STANDING COMMITTEE ON INDUSTRY, SCIENCE AND RESOURCES**

**Monday, 22 November 1999**

**Members:** Mr Lloyd (*Chair*), Mr Brough, Mr Hatton, Mr Lawler, Mr Allan Morris, Mr Nairn, Mr Prosser, Ms Roxon, Dr Washer and Mr Zahra

**Members in attendance:** Mr Brough, Mr Hatton, Mr Lawler, Mr Lloyd, Mr Allan Morris and Dr Washer

**Terms of reference for the inquiry:**

To inquire into and report on the prospects of increasing value-adding to Australian raw materials. The Committee will start with an evaluation of the current state of value adding in Australia, and how that compares internationally. This will provide a base from which to evaluate the following topics:

- incentives and impediments to investment;
- intellectual property rights;
- national/international marketing factors which may encourage or hinder Australian value-adding;
- government intervention, both nationally and internationally;
- the location of value-adding industries and projects in regional Australia;
- resource licensing/permit arrangements;
- the impact of vertical integration within particular industries; and
- the Australian skills base and any associated impediments.

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**Committee met at 12.22 p.m.****GORDON, Mr Robert George, Executive Director, Fuel Ethanol Association of Australia**

**CHAIR**—Welcome. I have to remind you that the proceedings here today are legal proceedings of the parliament and warrant the same respect as the proceedings in the House. The deliberate misleading of the committee may be regarded as a contempt of the parliament. The committee prefers that all evidence be given in public. But should you wish at any stage to give evidence in private, please ask to do so and the committee will consider your request. Would you like to make an opening statement?

**Mr Gordon**—Yes, I would. Thank you for your welcome, Mr Chairman, and thank you for providing our association with the opportunity to appear before this committee to discuss value adding to Australian raw materials.

For our association, this is a valuable opportunity to talk about the substantial benefits associated with adding value to a potentially wide range of biomass feedstocks in Australia for the purpose of producing for part, or all, of Australia's future transport fuel requirements. If it is possible to realise this goal, the positive impacts for our nation in terms of future energy security, economic and social revival in rural and regional Australia, greenhouse gas abatement and other benefits would be enormous and would place Australia in a leadership role in our region in terms of renewable energy development.

We believe that it is important to address the potential impacts of a national biofuels industry for the following reasons, amongst others. With respect to energy security, there is slow but growing realisation that oil is the weakest link in Australia's energy portfolio, and that Australia's domestic oil reserves are expected to reach a point of exhaustion within 10 to 15 years. This development has major implications for our country's balance of payments, economy and national security.

Second, there is growing awareness of the need to address, in a sustainable way, the structural and social crisis that exists in rural and regional Australia. While current emphasis is on stemming the pace of change and finding a new balance or equilibrium in rural and regional Australia, we believe that adding process to biomass raw materials could be a catalyst for a major economic and social revival in regional Australia. The reason for this is that the bulk of our nation's biomass resources are to be found in rural and regional Australia.

Third, on any scale of measure, Australia is a major source of emission of greenhouse gas, and the transport sector is a major contributor to our national inventory of greenhouse gas emission. A national biofuels industry based on adding value to existing biomass feedstocks and to biomass raw materials that currently have little to no economic value would substantially reduce greenhouse gas emissions from the transport sector to a fraction of what they are today. Other environmental benefits associated with this industry would include restoring quality to our land and water resources, and dealing with urban air pollution.

Before proceeding to questions, it might be helpful if I take a few moments to describe the current state of biofuel production from biomass in Australia and elsewhere. In doing so, I will deal mainly with renewable ethanol fuel, as this is the most developed and advanced renewable biofuel production technology. Work is being done in Australia to develop biodiesel from canola crops, and work is being done in the Pacific islands and in Australia on the use of coconut oil for stationary power and transport use.

In Australia, ethanol is produced largely by two major companies: the Manildra Group and CSR Distilleries. It is produced from adding value to waste streams associated with the downstream industrial processing of food products. In the case of the Manildra Group, this involves intense industrial value adding to wheat to produce flour, starch, sugars and protein products—some 17 by-products in all—and adding value to starch effluent waste to produce ethanol. In the case of CSR, this involves producing ethanol from waste from their sugar production activities, namely waste molasses.

The important thing to note is that, unlike the United States and Brazil, Australia does not produce ethanol from dedicated food crops. It produces ethanol from the industrial waste streams associated with food production activities involving the use of wheat and sugar crops. The US and Brazil use dedicated food crops of corn and sugar to produce ethanol, and it is produced for the primary reason of producing ethanol—not food.

Today, Manildra and CSR between them have the capacity to produce between 150 million and 175 million litres of ethanol per year. Around 48 million to 50 million litres of the alcohol is consumed by the chemical and pharmaceutical industries. In the transport sector, the common form of use of fuel ethanol is as a 10 per cent blend with 90 per cent petrol. This is referred to as E10. The advantage of E10 is that no adjustment or change is required to the existing petrol vehicle fleet. Between them, Manildra and CSR would have the capacity to produce between one billion and 1.25 billion litres of E10 per year.

The United States is currently producing some 1.8 billion gallons of fuel ethanol per year, which translates into approximately 18 billion gallons of E10 per year for the transport fuel market in that country. In Brazil, some 15 billion litres of fuel ethanol is produced per year and used either in a 22.5 per cent ethanol blend with petrol or in ethanol dedicated vehicles.

Whether used as a 10 per cent blend or higher, biofuels such as ethanol produce major benefits when compared with petroleum fuels. They are renewable and achieve an actual reduction in greenhouse emissions as well as displacement of fossil fuels, and achieve substantial reductions in vehicle exhaust emissions that contribute to urban air pollution and impact on human health.

The challenge posed for most renewable fuels is: can they be produced in sufficient quantities to replace existing fossil fuels, and produced at a price that is competitive with petrol and diesel fuels? The answer to both questions is: over time, yes, these goals can be achieved. We believe that the transition from petroleum based fuels and renewable fuels could be generally seamless and without major disruption to the consumer or the automobile industry. As stated previously, adding value to biomass will be the key to the take-up of renewable fuels in Australia and elsewhere over the next 20 to 50 years.

**CHAIR**—As you can probably hear, the bells are ringing and parliament is in session so members will be moving in and out at different times, but I know that a number will be back shortly. If biofuel production is economically viable, why is it that some of the owners of agricultural and forestry residues do not seem to be pursuing value adding opportunities more vigorously? This seems to be an industry which has great opportunities, but it seems to be one about which it is difficult to in some ways spark the imagination of certain industries. Do you have any comments on that statement?

**Mr Gordon**—I think that is a reasonable summary. I think the answer is a multiple one. In the first place, there probably has not been a lot of awareness. I think there has been awareness of the necessity for finding products or uses for their waste streams, whether it is sawdust, the forest plantation thinnings or otherwise. But I think progress in those areas has been pretty slow over the years.

There is particular awareness in this area in the United States and in countries like Sweden and other countries in Europe about the potential that exists for the use of those forest wastes, plantation thinnings or sawdust or offcuts or whatever as a potential feedstock for the production of biofuels. I guess the answer as to why it has not happened is that work is still under way on demonstrating at a commercial level the technologies that would be used to convert those high volume feedstocks—which abound in great quantities; that being one of their great advantages—those biomass feedstocks from cellulose sources into ethanol.

This year in the United States, for example they had a groundbreaking ceremony in October in Jennings, Louisiana, with a cellulose ethanol plant which will use a combination of concentrated acid and recombinant organisms for extracting the five to six carbon sugars required to produce ethanol from B gas—that is the residues of sugar cane production. That is the first plant of that kind on this scale that the world will have seen. That project has the full support, including financial support, of the department of energy in the United States and the National Renewable Energy Laboratory, which is quite famous in the renewable energy area.

There are also plans this year to move towards the establishment of a cellulose technology ethanol plant near Sacramento. The government of California has banned the burning of rice stubble because of the high silica content in it and the risk to human health. It is proposed to use the rice stubble as a feedstock. There is at least one other plant proposed for the United States over the next two years.

In Australia itself, there is growing interest within the forestry industry. For example, the State Forests of New South Wales have committed \$2 million, as has the Commonwealth government, to a ligno-cellulose pilot plant demonstration utilising a whole range of biomass feedstock sources, including biomass from urban waste, rice stubble and forest waste product. That commenced after an extraordinary delay of some seven years. It kicked off in October. This is milestone No. 1 of the project which is designed to ascertain what that \$4 million will buy today compared with what it might have bought seven years ago. So I think it is a combination of things. We certainly see a growing interest amongst forestry groups, both private and state forests.

**CHAIR**—One would imagine the increasing world oil price would help give an added impetus to interest.

**Mr Gordon**—Certainly. You are going to see two things. The whole purpose in moving to this wider base of feedstocks is that many of them currently have little or no value, and they would be an excellent cheap feedstock to use—this is relative; they will take on value over time—for the production of ethanol with these technologies. So they offer great hope in producing high volumes of ethanol fuels in the future.

But there are two things that are happening. One is from the industry's perspective—and this is going on in the United States and Europe—in that there are intensive efforts to drive down the cost of production to be more competitive with oil. Also, from the industry perspective, it is quite welcome news to see that the price of oil is increasing so that the gap between both is coming closer together in terms of being competitive. We would not expect to see this current trend in terms of the cost of oil retreating in a significant way to what it has been in the past. If anything, we would see it increasing over time.

**CHAIR**—Has your industry accessed things such as R&D tax concessions and other innovation support programs? Also, are you happy with the level of support through such agencies as CSIRO and CRCs, cooperative research centres? Do you have any comments about those areas?

**Mr Gordon**—I guess it would be true to say that the industry has had a bit of a roller-coaster ride. You may remember that, back in 1993-94, the government entered into an agreement with the Australian Democrats to get its budget through. This resulted in an ethanol bounty scheme—that is what it was called at the time—which was valued at around \$25 million and was based upon a support of 18c per litre for ethanol producers. I must say that it was not a form or a description of a program that the industry would have proposed at the time; it was more a result of officials' advice to government.

Nevertheless, within 18 months of that program kicking off and after industry had invested some \$40 million and taken up the government's challenge to invest in innovative and new technologies, the program was withdrawn without much notice. That certainly had an impact on the industry. It did not stop it and, indeed, at the time the ethanol bounty scheme was withdrawn, I think the industry was producing about five million litres of ethanol a year, which translated into about 50 million litres of E10, for the transport fuel market. Today, about 50 million litres, or about half a billion litres of E10, is going into the New South Wales fuel market. That is with no assistance from the government at all, other than renewable alternative fuels being excise exempt as are other alternative fuels.

**CHAIR**—So the production has significantly increased since—

**Mr Gordon**—Yes. The commitment that was made in support of the ethanol bounty scheme was carried forward by industry. There was a delay of a couple of years before they were able to go ahead. But they have gone ahead now and we believe that CSR will also be joining Manildra very shortly in producing more fuel ethanol for the transport fuel market, and we believe that we will see some other players coming on the scene fairly soon.



**Dr WASHER**—What is the cost per litre at the moment to produce ethanol? What could you put it on the market for?

**Mr Gordon**—I am not privy to the actual cost of amounts that are produced, but the figure we would use would range between 60c and 69c per litre today.

**Mr BROUGH**—Production price or sold price?

**Mr Gordon**—That would be the production price.

**Mr BROUGH**—What is the price at the moment to the transport industry; what are they paying?

**Mr Gordon**—The consumer is paying exactly the same price for ethanol as petrol. The ethanol fuel has a benefit in the sense that no fuel excise is levied. I am not sure of what the actual excise levy benefit is, but it is sufficient to enable transport fuel companies to purchase ethanol fuel blended at 10 per cent with petrol and sell it at the going petrol price. Consumers, although they want to feel green and have a nice furry feeling, will not pay one half cent more for a green fuel. The benefit of the fuel excise exemption is sufficient to give the transport fuel companies that cushion or margin of profit. I cannot speak for them about exactly what they are paying at this stage; I am not privy to that.

**Dr WASHER**—You have mentioned a whole range of crops and materials that you can make ethanol from. What would be the most efficient crops? Would it be things like sugar cane or wheat, for example, that are grown specifically for that purpose? Or would it not matter in that you would handle waste material and process it through?

**Mr Gordon**—I think it would vary typically from crop to crop. The reason that the ethanol industry, as we know it today, is working and expanding is that ethanol is seen as a value added product. I mentioned that the Manildra Group produces some 17 high value by-products from a grain of wheat. They have an effluent waste stream which has reject starch in it. By throwing more starch back into that, they can create another high-value by-product—ethanol. Similarly, that principle applies with sugar, although they do not have as many by-products. So food industries that have multiple by-products and waste streams that they can utilise will always be quite competitive and effective producers.

A lot of work needs to be done determining just how much ethanol, for example, you might get out of a dry tonne of timber thinnings from a plantation, or how much ethanol per tonne can be got from crop stubble or cotton ginning trash, or biomass from urban waste or grass or garden trimmings and those sorts of things. So there is a lot of work to be done, as the chair said before, by organisations like CSIRO and others to determine that.

My own guess would be that, because you have an existing and quite robust sugar cane industry—even though it is in crisis and there is a lot of international pressure on sugar prices—the use of bagasse would probably be the first cellulose ethanol plant technology that we would see here. Bagasse at the moment is being used rather inefficiently for combustion for steam and energy for the sugar mill. If you were to convert bagasse into ethanol, you would get the ethanol and a solid by-product called lignin which has a high caloric content.

Lignin would be much more efficient in producing steam and energy for the sugar mill than the bagasse combustion technique used now. Laboratory tests suggest that probably about 25 per cent of the energy that would be produced from lignin would be available for the local grid. The answer is that we do not know the answers to all those questions yet.

**Dr WASHER**—You have mentioned also in your submission these flexible fuel vehicles. What do you have to do to a vehicle to make it flexible? Am I right in saying that they take only up to 15 per cent, or can they take greater?

**Mr Gordon**—No. Flexible fuel vehicles are a very exciting development. By the introduction of a computer chip on the on-board fuel system, flexible fuel vehicles can regulate, without any adjustment or intervention, the use of up to 85 per cent alcohol and 15 per cent petrol or 100 per cent neat petrol. So they are a very attractive option, which means that automobile technology is moving at a rate where high volume take-up of fuels such as alcohol fuels is becoming a real possibility.

At the moment, we use a 10 per cent blend because that is found to offer the most ease of use by the consumer in any vehicle without there having to be any adjustments to the vehicle's engine. In reality, you could probably use about 22 per cent. But alcohol is quirky. At around 18 per cent, some things happen and you might get a vapour lock. So the safest route seems to be E10 for the moment. But with the flexible fuel vehicle technology that is coming on stream new opportunities arise. Ford Motor Co., General Motors and Chrysler are all producing commercially available flexible fuel vehicles this year. I think they are slated to produce approximately a quarter of a million in the US.

**Dr WASHER**—If we made a rough assumption—and I guess you have looked at total fuel consumption in Australia—with the diesel you have mentioned, et cetera, and were to put 10 per cent ethanol right through that, by how much do you estimate our greenhouse gas emissions would be reduced in order to meet our Kyoto conference agreement?

**Mr Gordon**—The exact figure would take some working out. Most people accept that you get a rough displacement equal to the amount of substitution. But, to be on the safe side, you could be confident of getting at least a seven per cent reduction if you use a 10 per cent ethanol blend.

**Dr WASHER**—That is pretty significant.

**Mr Gordon**—It is, yes.

**Mr ALLAN MORRIS**—Mr Gordon, this part of the inquiry is trying to get some benchmarks in terms of Australia versus the world and how we are going in comparison. In your submission you have made particular reference to Brazil and America. Do you have any broader figures about the American and Brazilian percentage of substitution that is taking place overall? You have mentioned some figures, but there does not appear to be a straight figure, or is it just that one is not available?

**Mr Gordon**—The US substitution is about eight per cent; in Brazil it is varied. But Brazil is an interesting example because it shows up many of the benefits of ethanol but also

shows up some of the things that a country would need to look out for; it is not necessarily the best example. At the height of the use of ethanol fuel between 75 per cent and 80 per cent of their fuel was derived from ethanol based on their sugar cane crops. But they found that, in using a dedicated food crop, it could be impacted upon in some years by the world price for that commodity.

Typically what happened was that, when the price of sugar went up, they started to sell more of the sugar on the world market. This impacted on us as well, as it did recently. Then they would substitute the alcohol component by buying and importing methanol. I believe—and this would just be a wild guess—that they would currently not be using more than 55 per cent to 60 per cent of the crop as ethanol. But, again, it is going through a cycle where, with the use of ethanol in a 22.5 per cent blend, and up to 100 per cent in dedicated ethanol vehicle, there is an upward trend again now in ethanol use because they are starting to use more of the sugar crop for production of ethanol.

**Mr ALLAN MORRIS**—From recollection, a Los Angeles rule for public transport vehicles is that they are required to use methanol for air pollution reasons.

**Mr Gordon**—MTBE, yes.

**Mr ALLAN MORRIS**—That appears to have succeeded to some degree in reducing their air pollution. Is that happening in other parts of the world to any serious degree that you know of?

**Mr Gordon**—The United States over the last 20 years have taken a variety of routes and measures in trying to resolve the issue of air pollution. One of them was reformulated fuels which the oil industry produced from a blend of a whole range of aromatic by-products. But they also mixed in a component of oxygenated fuels. Ethanol fuels and methanol, or alcohol fuels, are called oxygenated fuels because they have a higher oxygen content. I guess if there is any magic about ethanol blending with petrol, it is that you inject more oxygen into the fuel. In that way, you have a more efficient combustion of fuel in the engine and there is less rubbish coming out of the exhaust pipe at the end of the day.

Under the fuel air act, Congress passed a law about using oxygenated fuels in transport fuels in the United States, the two fuels being ethanol and methanol. The ethanol type is called ETBE—and do not ask me, please, to expand on these acronyms—and MTBE, which is the methanol based. At the moment there is a major desertion from MTBE underway because it has been found to be leaking into the watertable and the fresh water supply in California. I believe there has been a formal decision to abandon the use of MTBE by regulation in California over the next two years. Many other states in the United States that were using MTBE are getting out of it as quickly as possible. You do not have the same problem with ethanol in the sense that ethanol is miscible; it breaks up more easily in water.

**Mr ALLAN MORRIS**—You have just said that they plan to get rid of ETBE.

**Mr Gordon**—The use of MTBE.

**Mr ALLAN MORRIS**—You said ETBE as well.

**Mr Gordon**—No, just MTBE.

**Mr ALLAN MORRIS**—I think it must have been a slip of the tongue.

**Mr Gordon**—I am sorry. I meant MTBE.

**Mr ALLAN MORRIS**—So, in terms of pollution, ethanol does break down whereas methanol does not.

**Mr Gordon**—Correct, yes.

**Mr ALLAN MORRIS**—I suppose that the two public constraints the world is putting on are in the areas of both greenhouse and pollution. Wasn't Europe doing something about it as well? Wasn't Europe at some stage talking about or working at changing some of its rules about fuels?

**Mr Gordon**—There is a lot of talk at the moment in Europe, just as there is in the United States, about producing renewable fuels and fuels from biomass. There is work going on in Europe in developing refining technologies to make this possible.

**Mr ALLAN MORRIS**—It is not yet mandatory.

**Mr Gordon**—No.

**Mr ALLAN MORRIS**—I would have thought that, with European fuel prices being so much higher than the figure you quoted earlier—and that was 69c a litre, which is about half the price of petrol in Europe—they would be doing it because it would be a lot cheaper, a lot more profitable.

**Mr Gordon**—Yes.

**Mr ALLAN MORRIS**—You have mentioned the two or three plants in the United States that are being built for cellulose conversion.

**Mr Gordon**—That is right.

**Mr ALLAN MORRIS**—I presume that someone has done the sums on that kind of plant in Australia.

**Mr Gordon**—Yes. We are not at the point where we are about to build a plant here. But the cost to production that they are looking at from bagasse and forest products is around 40c to 45c per litre. The studies that have been done in America and elsewhere over the past 10 to 15 years on cellulose feedstock suggest that you would be looking at the cost of production ranging probably anywhere from 25c to a top of 45c for forest and other biomass wastes, based upon the assumption that they will never always be free; that once you find a use for these biofeedstocks they will take on a value. That is one of the reasons why they have real potential for regional and rural Australia.

It worked out that probably the peak production costs of ethanol from forest thinnings over time would be—I cannot recall the exact amount per tonne—40c to 45c at its highest level. The ethanol pilot plan, which hopefully will kick off next year, is using those basic assumptions. Its business plan and studies are in that ballpark.

**Mr ALLAN MORRIS**—Is there a need then to establish credibility with the Australian public that ethanol as an alternative fuel is actually viable and non-damaging to vehicles?

**Mr Gordon**—That has been pretty well-demonstrated. There have been ethanol blend fuels sold in a 10 per cent blend in New South Wales—currently through approximately 200 service stations in regional and rural areas and some urban areas in Sydney since 1992. It has been sold with virtually the same record of performance there as over the past 20 years in the United States.

The advantage of this type of fuel is that there is very little that is not known already. When they first introduced the fuel here, I think a Falcon utility model had a fuel gasket that started to show some sign of erosion. But that was a one-off and it was picked up fairly quickly—although, if you had asked the Ford Motor Co. at the time, they would have exhibited a sort of collective amnesia about what they were doing in the United States for about the past 20 years with fuel ethanol. There is very little mystery for the consumer, and the response has been excellent.

**Mr ALLAN MORRIS**—So it is simply price driven. So you are saying that there is no need for any action by any of us in the sense of national policies; that, if you were producing it at 45c per litre, it would be viable for it to happen of its own accord.

**Mr Gordon**—There is a need for some national policies here. We are talking about stimulating the start of a new industry which will need the same general sort of policy support and creative support, whether it is the continuation of the fuel excise exemption or support for accelerated funding for R&D and setting up new plants and new technologies for the production of ethanol around Australia. There will certainly be a need for that.

For example, the cellulose ethanol plant going up in Jennings in Louisiana, will be around the \$90 million mark, together with I believe, \$11 million to \$15 million of Department of Energy funding. So I think, like the oil industry itself when Australia 50 years ago started to work hard to achieve energy security in domestic oil supplies, we found ways of stimulating industry to invest and grow that industry. This industry will need that as well.

Since the ethanol bounty scheme has been removed, I think the industry has been shown to be pretty resourceful and very determined. They will make the necessary investment if the climate is right. We would certainly hope to see the continuation of the excise exemption for some time to come. We think that the extension of the fuel excise exemption to diesel fuels under the new Greenhouse Gas Abatement Program is a very positive development because it will, for the first time, stimulate ethanol blend fuel at 15 per cent with diesel fuel.

**Mr ALLAN MORRIS**—Although with GST and so on, that will not be as attractive, will it?

**Mr Gordon**—No. Under this scheme, the relative value of the excise exemption will be maintained. I am not aware of the exact details of that. I think they are with the ATO/Treasury at the moment. But there have been discussions with industry and a number of options are being looked at to keep the relative value of the fuel excise exemption.

**Mr ALLAN MORRIS**—I am surprised. I would have thought there was an argument that said that diesel trucks being used in cities should be using broken down diesel because of the sheer pollutant they pump out. You have to be stuck behind a few of those trucks to see it. I am surprised that you have not had to come up with that as a recommendation, either in person or in your report. I suppose I have been trying to suss it out of you, but you have been very reluctant in that regard. The Americans have done it quite readily and apparently quite successfully. Given the Sydney problem of phototropic pollution and so on, it just seems that it would be essential.

**Mr Gordon**—We would be delighted to see it. We would be dumped on from every corner of the place if we did.

**Mr ALLAN MORRIS**—You made the point that you can produce it below the cost of the equivalent, so there is no economic penalty; you are not looking for subsidies to do it with; from all that you have said, it is quite viable; and I think Dr Washer raised the point about the greenhouse Kyoto agreement. All those forces are there. I would have thought it would be logical to say that it requires somebody to sit down and put it all together. The logical conclusion is that, unless you make these changes in air pollution terms, Sydney is not going to change.

**Mr Gordon**—I think this is because Australian history towards industry has been one of voluntary compliance.

**Mr ALLAN MORRIS**—Not with seat belts and not with all the road rules. All the road rules are compulsory; they are not voluntary at all. We do not have voluntary wearing of seat belts or voluntary speed limits; we have quite compulsory ones. We are suggesting that air pollution is voluntary but speed and seat belts and other things are not. Vehicle safety is not voluntary. All the other aspects of motor cars are compulsory, except the pollutants that they produce.

**Mr Gordon**—I can assure you that I would be delighted if that were the case. You will find that the oil industry would resist this quite strenuously. When we have talked about this sort of thing in the past, we have attracted a lot of criticism. I think the main thing is that, while we would be quite supportive of that—and it may come to that if Australia fails to meet its greenhouse gas obligations over time—the historical trend here has been to exhaust all remedies for voluntary compliance with industry first.

**Mr ALLAN MORRIS**—Except with the air pollution from cars. We have a zero emission level at some point in the future—and I think we keep on adjusting that. For cars with petrol engines, the requirement for the reduction of pollutants is set, but I think we keep adjusting the time it will be made compulsory. The aim was to get zero emissions but not for diesel.

**Mr Gordon**—No-one has achieved the production of an engine that has zero emission—

**Mr ALLAN MORRIS**—Honda say that they have.

**Mr Gordon**—At the same time I am quite sympathetic to the automobile industry because 92 per cent to 94 per cent of all improvements in vehicle emissions have been made by the automobile industry, not the petroleum industry.

**Mr ALLAN MORRIS**—But that is compulsory. I just find it ironic that you are being so sensitive; we are happy to enforce compulsory air pollution measures for the car manufacturer but not for the fuel manufacturer.

**Mr Gordon**—I would have no objections about that myself, I can assure you.

**Mr ALLAN MORRIS**—I have been thinking out loud. Thank you.

**Mr HATTON**—I have drunk alcohol so I understand something about the vapour lock effect. I have heard that cane spirits are pretty strong as well, and I think probably we all have had a bit of bundy rum. How do you make ethanol, and why is it a purer substance to use than petroleum based products or diesel?

**Mr Gordon**—First of all, petroleum products are an ancient biomass of decaying matter. The processes for producing it are different. I will not go into all the details, but before I leave I will give you just a short summary of what is petrol and what are the constituent parts of petrol and what is alcohol.

Essentially, alcohol is based not on the production of decaying matter, animal or plant but the extraction of five to six carbon sugars that exist in plant matter. That is done by a combination of the use of enzymes and the process of fermentation—a more advanced form of the fermentation that was used to make moonshine or whatever.

The new technologies for producing ethanol that we are talking about will be a combination of recombinant micro-organisms that are being developed and the use of processes to produce hydrolysis, the separation process, such as concentrated acid or dilute acid. One of the challenges in the past in using acid has been: how do you recover that acid without it becoming an environmental hazard? One of the innovations in the Australian ethanol plant is that an Australian scientific group has come up with a means of waste recovery of the acid and then recycling it back through the process.

So the production methods are different. They say that in the best place in the Middle East you can virtually put a straw in the sand and almost suck out the oil; it is a much cheaper product, but it is also quite expensive once you get to the refinery level to start to crack it to produce your transport fuel product. I do not know scientifically all the reasons why it is a cleaner fuel, but it certainly is. It does not have the aromatic problems associated with petrol. It does not have the toxic carcinogenic problems linked with petrol.

**Mr HATTON**—As far as we know?

**Mr Gordon**—Alcohol has been around for thousands of years. Science has been working with alcohol fuels for a long, long time. We are not saying that it has a perfect track record. There is an increase in evaporative emissions, for example, and there is a lot of debate about the impact of evaporative emissions on the environment. But, so far, scientific examination has established that it is at such a low level that it does not rate serious mention at the moment.

**Mr HATTON**—But it also has not been used at a higher level, so that would have an impact as well, I would think.

**Mr Gordon**—That is correct, it has not been used at high volume in Australia, although it has been used in 100 per cent or dedicated ethanol vehicles.

**Mr HATTON**—In Brazil.

**Mr Gordon**—I cannot say that I am familiar with the emission studies that have been done over that period of time in Brazil, but I am unaware of any major or serious environmental impediment to its use in Brazil.

**Mr HATTON**—Going to the amount of energy required and those two methods that you outline, you have mentioned the use of sugar cane in Brazil. Given that we belt the daylights out of sugar cane here to extract what we want from it—it is essentially crushing and then going through a series of other processes to extract it—how energy intensive is the process that is mostly used now to create ethanol? Also, if you are using forest products or stubbles and so on, how energy intensive would they have to be? That also is part of the equation you would have to look at.

**Mr Gordon**—That is true. In the case of the ethanol that is produced now, before you get your waste stream which you are using to produce ethanol, such as from wheat, for example, there has been a whole intensive industrial processing of that grain of wheat to produce a large number of by-products already. So there has been a considerable amount of energy used in transforming that grain of wheat into a range of by-products and then that waste stream. The amount of energy used in terms of that next step of converting it into level would not be considered to be excessively high.

If you are talking about a greenfields plant—because one of the advantages of producing ethanol at the back end of a food industrial plant at the moment is that all your energy generators and sources are already in situ, they are in place—yes, there would be some substantial energy input into that. But you need to remember at the same time that, if you are producing lignin as a by-product and you are using that as your source to produce combustion and electricity and steam, the energy input should not be excessive. I can get more information on that if you are interested.

**Mr HATTON**—I will go to an associated question. If you are using forest waste products, forests are fairly big and are not like a chook pen where the chook is going to scratch around the yard and collect a bit of stuff together. They are large and they are dispersed. They take certain portions and clear them at particular times, but forests are spread over a lot of Australia.



In terms of that dispersion, in terms of using waste products, you have not only the cutting and felling and then the collecting of those and the amount of human resources you have to use, but you also then have a problem in terms of transportation and energy values in relation to that. So it is not just a process of 'there is the biomass,' and we do not have to think about collecting it and transporting it to where it will then be transformed into something else. If those forest waste products were used, would you see there being a necessity to have a very large number of small-scale plants around the country, or would you see it as a smaller number of larger plants based around particularly forest plantations?

**Mr Gordon**—If we were looking at potentially, for example, producing 30 billion or 40 billion litres of ethanol fuel for the transport market a year, we would be looking at a wide variety, a wide number of different scale and different size ethanol plants. The size of the ethanol plant will be determined, firstly, by the availability of the feedstocks, whether it is forestry or other feedstock sources; and, secondly, by factors such as those you have mentioned: what is your radius of circle of supply. How far do you have to go to bring it to the ethanol plant for conversion?

The vision we have on the forestry side is somewhat along the following lines. As you know, one of the problems associated with growing private plantations is that you have to thin out your plantations over the tree growth cycle to promote healthy growth of your trees. There is no economic value ascribed to that activity at the moment. That will be one of the major impediments to the large scale forest growth that people and governments talk about today. Until you can find an economic value for those activities, it will be a real problem for a lot of large, medium size and small scale forest growers.

What we would see there, for example—and we would see it in a similar way for state forests, although we are more careful when we talk about state forests because that is a very sensitive issue—is that typically a contractor would come along with a chipper and enter into a contract with the plantation owner to thin out that plantation and chip it and carry it to an ethanol plant. We would see similar activities taking place in larger forest plantations, whether they are state run or otherwise. As you know, there is a lot of ongoing activity. A lot of this activity would be associated with traditional sawlog exploitation from state and plantation forests. Brush, timber offcuts and sawdust would also be available, and the sawdust is easy because it is already in fairly fine particle form.

But we do not see any major technological barriers. Our forestry growers and our farmers really are very innovative. They have a wide range of skill sets that are quite adaptive to taking on these new roles. So we do not see any need for any rocket science to be involved here. We think there will be a lot of practical application of existing technologies and adapting those technologies to do that. But yes, the size of an actual plant will be determined in part by the volume of feedstock available and questions such as the distance you have to take that feedstock from source to the plant.

**Mr HATTON**—You would also have the size of the afforested area that you are actually trying to take stuff out of and the fact that those thinnings might only come once every 10 years, which is fairly usual, and then developing different ways of doing it. What is the attitude of your organisation—if it has a specific attitude—to the extraction of oil from shale and whether a white hat or a black hat should be attached to it?

**Mr Gordon**—The general attitude to shale oil is that it is probably the least attractive option to take up, in terms of both cost and the environmental problems associated with its extraction and production. Having said that, it is quite interesting; we have been approached by South Pacific Power who are setting up a shale oil plant in Queensland. At the same time they have expressed an interest in setting up an ethanol plant up in that region. I was quite taken by surprise at the time that they were thinking in terms of both shale oil and trying to exploit renewable energy resources to produce an alcohol fuel.

I think we will have to just wait and see, first, what the economics of shale oil are; and, second, whether it will be acceptable to government in terms of environmental impacts. I can see the urgency of trying to look at any available resources we have to deal with the undoubted loss of our domestic oil reserves in the next 10 to 15 years.

**Mr HATTON**—Yes, and either biomass or shale on its own over time could supplant all of the import that we have now and provide for our needs. But there are some who, in a black hatted fashion, are arguing against the extraction of that oil from shale and saying that it is bad because it is another fossil fuel and that we should be doing away with all fossil fuels completely. That is why we have to go to alternatives.

**Mr Gordon**—That would not be a view that I share. I think we have to acknowledge, over the past 50 or 60 years, the contribution of fossil fuels to our society and the way our society has developed in how people can move about more freely as individuals in our country and elsewhere. With the contribution it makes to a whole range of products, plastics and otherwise, I think one has to acknowledge—and historians will note—that the oil century has brought some substantive benefits to Western or global society as we know it. But it has also become obvious that it carries a lot of heavy baggage.

Our view is that any alternative fuel, if it is to be viable and replace existing oil fuels, will need time. We are probably talking about the same time cycle as it took just in Australia to get a reasonably viable domestic oil industry going, and that was around 50 years. So we are looking at about 10-, 20-, 50-year time cycles for various phases of the growth of our industry. So no, I am not one to throw stones at petroleum. I think it has undoubtedly made an extraordinary impact on society as we know it. But I would say that you can see the end of it; that the century of oil and the end of oil is approaching.

**Mr LAWLER**—Who are in the Fuel Ethanol Association of Australia? I gather from what you have said that none of the oil companies are.

**Mr Gordon**—No. The association membership is made up of producers, distributors and people who are in the research side of it. So it encompasses the industry as a whole. The attitude of the oil industry has been quite blunt and negative. For example, when the Manildra Group went along to the oil majors in 1992 and said, 'We'll be producing excess alcohol and we'd like to blend it with petrol as a transport fuel which should benefit petrol fuel because it will reduce the amount of emissions coming out of the tailpipe,' the response was a blunt one. It was, 'We won't take any of it.' Following the US historical example, Manildra went out and secured support from private petroleum companies to use the fuel, to buy the fuel and blend it with their petrol products.

When CSR, during the ethanol bounty scheme, tried to sell ethanol blend fuels at 10 per cent, they again went to the oil majors and were given a blunt rejection. Indeed, none of the major oil companies in this country take up and blend or distribute an ethanol blend fuel. In the United States, they were forced to because of the Clean Air Act and for regulatory reasons they sell ethanol blend fuels 24 hours a day every day.

**Mr LAWLER**—I just imagine that it would be easier to get the thing going if you had them onside rather than fighting against you.

**Mr Gordon**—There is no difficulty from our industry's point of view in having a good relationship with the oil industry; it would be a very constructive thing. I think it is the view of the oil industry—and I think it is a pretty blunt and simple view—that they can see no reason why they should shift one inch to give a potential competitor market share.

**Mr LAWLER**—Is the process already available for all these more obscure sources of fuel like woody weed and so on? Is that already able to be done, or does work still have to be done on that?

**Mr Gordon**—At the laboratory and the bench level, yes, they have been demonstrated. The real push now is to provide a commercial scale demonstration, to set up an ethanol pilot plant of sufficient volume to be commercially relevant. That is what we are seeing in the United States and I hope what we will soon start to see in Australia. You are talking probably about a process now, in terms of time, of three to five years when we would expect to see a range of options, different approaches being adopted. We would see Australia being a beneficiary of this process.

**Mr LAWLER**—You talk about the water miscibility of the product being a positive, which I guess it is. Unless I misunderstood you, you also spoke of some of the fuel getting into the watertable in the States. Is there not some advantage in that, if you have an oil spill, at least you can see where you have to clean up, whereas with a spill of this type of fuel you would not?

**Mr Gordon**—It is MTBE where they have the trouble with the watertable; that is the methanol blend. They do not have a problem with ethanol fuel in this regard. Miscibility has its advantage in that, if you do have a spill and it is in water, it breaks up and becomes part of that water environment very quickly, unlike oil. It is a problem, for example, in diesel fuels which have more water molecules in them. So you need some means of bonding the ethanol with the diesel fuel. An Australian scientific group have come up with a polymer bond which works very well for blending diesel fuels with ethanol now.

**CHAIR**—Thank you very much. Your evidence has been very informative. The information you have provided to the committee will be very useful.

Resolved (on motion by **Mr Hatton**):

That this committee authorises publication, including publication on the parliamentary database, of the proof transcript of the evidence given before it at public hearing this day.

**Committee adjourned at 1.25 p.m.**

