ECONOMIC DEVELOPMENT AND INFRASTRUCTURE COMMITTEE

Inquiry into Mandatory Ethanol and Biofuels Targets

Melbourne—6 August 2007

Members

Hon. C. Campbell
Mr P. Crisp
Mr E. Thornley
Mr D. Davis
Hon. M. Thomson

Chair:Hon. C. Campbell
Deputy Chair: Mr D. Davis

Staff

Executive Officer: Dr V. Koops
Research Officer: Ms Y. Simmonds

Witnesses

Mr D.A. Munro, Senior Consultant, Synergetics Environmental Engineering.

The CHAIR—I welcome Mr Doug Munro to the public hearings of the Economic Development and Infrastructure Committee's Inquiry into Mandatory Ethanol and Biofuels Targets in Victoria. All evidence taken at this hearing is protected by parliamentary privilege. The comments you make outside the hearing are not afforded such privilege. Mr Munro, could you please state your full name, business address, and if you are attending, representing an organisation, what position you hold within that organisation. Thank you.

Mr MUNRO—My name is Douglas Alan Munro. For the purposes of this presentation I am a senior consultant with Synergetics Environmental Engineering of 490 Spencer Street, Melbourne.

The CHAIR—Thank you very much. You know the order of things. Over to you for your verbal presentation. If you can allow us as much time for questions, we would appreciate it. Can I publicly thank you for the very good submission and detail contained within it. We commented before this meeting on how helpful it is.

Mr MUNRO—Thank you Chair. Chair and members of the Committee, thank you very much for the opportunity to make this submission. I apologise for the absence of my colleague Dr David Collins, the Principal of Synergetics, who is unable to be here today. The way I would like to present this material to you is a few brief opening remarks, a comment on the terms of reference. I would then like to step through with you fairly briefly some of the matters for consideration that I have given to you on a special note, and then draw my conclusions. I have prepared three recommendations, if I am asked about that at the end of the presentation.

Synergetics is a specialised environmental engineering firm. It has strong interests in sustainability, including transport and energy use, and hence this encompasses biofuels. Synergetics has no vested interest. It is neither a producer of biofuels, nor has it links with the petroleum industry, motoring organisations or conservation groups that might lead to a position of supporting or opposing mandatory biofuels targets. However, we do have a bias. We believe that good science and analytical rigour should be important parts of decision-making, but we acknowledge they will not be the only parts. Synergetics does not take the position of supporting or opposing mandatory targets for biofuels. Our position is that we believe that in forming its position there are many issues that need to be considered by the Committee. We have attempted to identify those issues that we believe are important to present to the Committee to provide some discussion of those and to suggest how these might be given attention.

I have circulated to you a short document listing a number of those issues. May I first make reference to the terms of reference. We have had close regard to the terms of reference of the Committee. To give focus to our submission, we have directed our attention to possible mandatory targets for ethanol in petrol and for biodiesel in automotive diesel fuel, with both of these biofuels, that is ethanol and biodiesel, coming from contemporary, commercially proven processes. They are, for ethanol, the production of starch from grains, in the case of Victoria and, in the case of biodiesel, the production by transesterification from tallow and from oil seeds.

Our submission focuses on the use of these products in transport fuels. I comment on that, as far as petrol is concerned, most petrol is used for road transport fuels; and little is used otherwise, such as in boating and small motors. In diesel, the position is very much different. Whilst a lot of diesel is used on road, about half of the total automotive diesel in Australia is used for off-road applications, such applications as farming, construction works and mining works. That has an important implication in that if one considers mandating biodiesel in diesel, that will cover that off-road market as well. We have however in our presentation not given attention to other alternative fuels, such as CNG and LPG, or indeed to other biofuels,

such as biomethane, or indeed to non-transport applications.

May I refer you to the matters that I set as notes for presentation to the Committee and take you through these, if I may. On the first page we have presented matters that relate to both ethanol blended into petrol, and biodiesel into automotive diesel fuel. The first point we note is that we expect the Committee will have established or will establish its statutory position in its ability to set minimum levels. We are well aware of the Commonwealth Fuel Quality Standards Act 2000 and of its operation and of the determinations thereto that set specifications for fuels. We are aware that where specifications are not covered, states can set their own, as has been the case with the volatility or Reid Vapour Pressure of petrol. We are also conscious that under the petrol determination there is a maximum limit of 10 per cent by volume of ethanol in petrol.

The second point we draw to your attention is the issue of the source of raw materials and specifically the land available to produce crops. This has been mentioned to you by other speakers, and it is probably worthwhile reiterating that there needs to be regard had to what crops might be used to produce biofuels and what land will be taken up for that. Let me cite an example of that. The ethanol plant that is under construction at Swan Hill is proposed to produce about 100 megalitres of ethanol per year and consume about 250,000 tonnes of grain per year. If one was to mandate ethanol in petrol in Victoria at a level of 10 per cent, that would require about 500 megalitres of ethanol per year that pro rata would then require about 1.25 million tonnes of wheat to produce that ethanol, if indeed that was the source. The data I have sought out suggests that Victoria's wheat production in a year—in a reasonably good year—is about 2.7 million tonnes, which would mean something approaching 50 per cent of that wheat crop could notionally be diverted to ethanol production.

If we extend that to a national basis, evidence has been given to the Committee suggesting that Australia's production of grain per year—in a good year—is something like 27 million tonnes. There seemed to be some disagreement about how much is used for domestic consumption, but somewhere between, say, 7 and 10 million tonnes, leaving 17 million tonnes for export. If grain was the sole source of ethanol in Australia—and one produced 10 per cent ethanol blended petrol in Australia—extending the Swan Hill data, that would suggest that one would need about 5 million tonnes of grain per year to produce that amount of ethanol. Divergent views have been expressed to the committee as to whether the diversion would be significant or insignificant.

The next point I draw to your attention, the third one, is the water availability for crop irrigation and biofuels production. I do not intend to expand on that because I am sure the committee is very well aware of the issue of water availability. The next is the consequential effects on production of food and fibre, consumer costs, other industries—and I had in mind there the feedlot industry—and on export markets if grain is diverted to biofuels production. The next point is a comment that the nature of the biofuels industry would tend to be such that one would expect smallish plants, compared with oil refineries, in various rural centres, and by their very nature it is likely that transport of grains to those centres and transport of product from those would be more likely to be by road than by rail, although perhaps not necessarily so.

Mr DAVIS—Just interrupting there, is the international evidence that those smaller plants are as efficient as larger plants?

The CHAIR—Can we hold that for the first question? You can have the first question.

Mr DAVIS—Okay.

Mr MUNRO—Next, one needs to ensure that fuel blending is available to ensure that all transport fuel meets statutory biofuels requirements. Whether this is biodiesel being blended into automotive diesel fuel of ethanol into petrol, it is important that quality requirements be met. That becomes logistically more difficult if that has to be done at a dispersed number of terminals and depots than it does if it is done at major oil refineries and oil terminals. The next one is compliance assessment with minimum biofuels requirements, ensuring no breaches under the Fuel Quality Standards Act and vehicle manufacturer fuel specifications. This again is the issue of ensuring the high quality of fuels and that inadvertently there are no breaches of standards. Implicit in this is that if one is going to mandate biofuels as ensuring that there is a compliance and enforcement program that is in place that can ensure consumer confidence.

The next one I wish to develop a little, this is taken over the full life cycle, including all the aspects of crop growing right through to blending that substantial greenhouse benefits are realised. This is a rather contentious issue. Work that was done in about 2003 by [CSIRO] and [ABARE]—and I see that Dr Tom Beer will be presenting to you later this afternoon—suggested that for ethanol the greenhouse gas carbon dioxide benefits are probably fairly small and it depends very much on the source of the raw material used for ethanol production; it depends on the production processes and the like. It varies a bit from, say, sugar to grain. Some more recent work in 2005 by the Commonwealth Biofuels Taskforce suggested that the greenhouse gas benefit for ethanol might be positive but very small. The work however does suggest that the overall greenhouse gas benefit for biodiesel is more substantially positive than that for ethanol. We think that is a very critical issue that has to be taken into account in any decision-making because of the frequently held view that these fuels are renewable, suggesting that there is in fact no greenhouse issue involved with them.

The next point is that there is net economic benefit from the local production and use of biofuels, particularly in regional Victoria, and we note this is an important part of your terms of reference. We are conscious—one of our colleagues involved in rural industries is very much aware of the issues of using crops to produce fuels as against the use of cropping material for animal feed and the like, and in this we suggest there is a need to be sure that there is going to be a net economic benefit. The final one on that page is solid and liquid wastes and co-products from biofuels manufacture are properly manufactured. With regard to ethanol production, the Committee would have heard from others about the issue of distillers grain and what might be done with that material. In producing biodiesel, one has to use methanol as part of the chemical processing. One produces material from the crushing of the oil seeds, which produces a meal, some of which we understand can be used as stock feed, but the process also produces glycerin. Glycerin does have a market so it is an important co-product. But like any wastes or co-products and processes, it is a material that has to be properly handled. I might add there, with small biodiesel producers, such as we hear of on farms and the like, we do wonder how some of these materials are handled, the methanol and the glycerin.

If I can turn to the next page, we have a few items here that are specific for ethanol blended petrol. We suggest that the higher octane number available from ethanol should be taken advantage of. We have covered that fairly extensively in the previous submission that Synergetics made to the previous inquiry, which we would be happy to explain further if needed. Next: the Reid Vapour Pressure, the limits for petrol are not exceeded. Again that was covered in the previous submission but briefly what it relates to is that volatility limits are set on petrol under state legislation because hydrocarbons that are lost from petrol can contribute to photochemical smog. If one adds ethanol to ungraded petrol, the volatility as measured by the Reid Vapour Pressure goes up. So far this has been dealt with in states by simply giving a waiver to the legislation. We think that is probably not the best policy approach to take, although it is difficult to do otherwise. It is possible for oil refiners to blend petrol so that it is not at a marketable grade but it can then have ethanol added to it that keeps

within all the specifications, including the Reid Vapour Pressure.

The next one is a note that ethanol does not exceed 10 per cent as required by the Fuel Quality Standards Act. That may produce a challenge because if the Committee is interested in mandating a minimum of 10 per cent ethanol in petrol, and the Commonwealth legislation has a maximum of 10 per cent, your analytical processes to ensure compliance are going to have to be very tight indeed. We would suggest to deal with that, if you are inclined to mandate ethanol in petrol, you set a minimum limit a little bit below 10 per cent. Next: not all vehicles can use ethanol blended petrol and I think a previous witness has provided material to you on that. Finally on that page, the retail price of the ethanol blended fuel represents the lower energy content and hence slightly higher fuel consumption of using ethanol blended petrol and a previous witness has provided material to you on that.

Finally on that page, that the retail price of the ethanol blended fuel represents the lower energy content and hence likely higher fuel consumption of using ethanol blended fuel. For a 10 per cent blend that is about a three per cent difference.

On the final sheet we have one point for biodiesel blended automotive diesel fuel and that is The biodiesel level does not exceed that recommended by vehicle manufacturers, and we understand that in terms of warranty conditions that is usually five per cent. Now if I can finally come to some conclusions that are quite brief.

Synergetics recognises that it seems uncertain whether there is a public good to be served by mandatory biofuels targets and what the extent of that might be. However it also recognises that there can be expectations of government fostering the use of alternative transport fuels. If the Committee considers that it is important that it moves in the direction of mandatory targets, we suggest that it might evaluate and consider a single rather than a multiplicity of targets. B5 or five per cent biodiesel blended with petroleum diesel seems to offer benefits in reducing carbon dioxide emissions and emissions of particle matter from diesel vehicles. Further there seem to be no significant issues of greater fuel consumption or variation from fuel quality standards with biodiesel. This position seems to be in contrast to that of ethanol blended petrol where the use and benefits are more controversial. If that is to be done, we suggest that the assessment and regular audit of environmental, economic and social issues is essential. We are suggesting that if biodiesel should be mandated, and there be biodiesel plants, that as part of the assessment process there should be a close evaluation of the greenhouse gas benefits, the economic issues and any social issues involves, and there should be a regular audit to see that those benefits are in fact delivered.

Since ethanol blended petrol will continue to be marketed and likely in increasing quantities we suggest that a mechanism is needed to evaluate the greenhouse gas and other aspects of that, that the Reid Vapour Pressure should be dealt with other than by granting waivers, and the octane benefits of ethanol are realised. In summary, Synergetics is of the view that the use of biofuels should be such the benefits that can be offered are in fact realised and that the disadvantages are minimised. Thank you very much.

The CHAIR—Thank you. Mr Davis goes first.

Mr DAVIS—Lots of questions and lots of further questions. One, obviously part-way through I was keen to ask about these issues of scale and about whether the benefits of small scale disbursed production overwhelm or exceed that of larger plants, either for ethanol or biodiesel, and there might be obviously quite two different answers there. I might let you answer that one first. The other point, the evaluation, are you in effect recommending that as part of our recommendations we would set some process or recommend the setting of some process in train that would allow regular assessments every few years, or how would you see that operating?

Mr MUNRO—If I take the first one to start with. It is not an area on which I have a great deal of knowledge. My understanding is that by and large ethanol plants and biodiesel plants are relatively small compared with oil refineries, whether this be here, in Europe or the United States, and that plants of production of 100 to 250 megalitres per annum would be quite typical. These tend to be distributed in regional areas. I can not comment on the economies of scale because I have no detail on that and I do not know of any biofuels plants that are in any way approaching the size of a conventional oil refinery.

Mr DAVIS—(indistinct) large, but yes.

The CHAIR—Your second question?

Mr DAVIS—Evaluation.

Mr MUNRO—Yes. Given what seems to be quite a deal of uncertainty as to the benefits, at least on a technical scale, greenhouse gas emissions, economic benefits and so on of biofuels plants, we are recommending that it would be advisable to have a mechanism for an individual proposal that the claims that are made can be evaluated. Now, it is not clear to me that that is something that can be done under a state mechanism such as a planning mechanism, or it might be done under a Commonwealth mechanism that has to do with financial support for such facilities. It would have to do with the processing plant itself, the source of the raw material for it such as where the crop is to be grown, the energy that goes into the farming activity, into harvesting and in transporting. From the processing plant itself it would then have to consider the issues in the transport of the product and the blending of the product. We would expect that at least the energy issues involves, and perhaps the economic issues, would vary a deal from year to year, depending on the growing conditions. We would suggest that there be some regular audit of that performance to see that real greenhouse gas benefits and real economic benefits are in fact delivered. We admit trying to set up a mechanism for that might be quite daunting.

Mr DAVIS—In continuation of that, what I take from part of what you are saying is that you do not believe that there is any clear demonstrated benefit for mandating an ethanol level. I am being direct here, but there does not seem to be any—you can not, with any degree of surety, say there is a benefit.

Mr MUNRO—No.

The CHAIR—My question is what if you were writing our report, what would be the three key recommendations? You sat here the other day and I am sure you are dying to tell us the answer to that question. If you have four, you can have four.

Mr MUNRO—I had six but I have consolidated them into three to help to the Committee.

The CHAIR—Part A and B of each.

Mr MUNRO—Firstly, if it is the view of the Committee to favour mandating a biofuel, it is recommended that it consider evaluating a single modest target in the first instance. We suggest that that might be biodiesel in automotive diesel fuel rather than ethanol in petrol. That flows from what I have presented to the Committee before. Secondly, that life cycle greenhouse benefits should be comprehensively assessed for each proposal and audited regularly. Such data should be made publicly available. Third, and I encompass about four in this one, similarly land and crop diversion, regional economic impacts, water use and related trade aspects should be assessed for each proposal and periodically audited.

The CHAIR—Thank you very much. Mr Crisp.

Mr CRISP—Perhaps I can ask you to look at the next generation of biofuels beyond where we have been at the moment, which is looking at our grains essentially in Victoria and our oil seeds. There is emerging a next generation using cellulose type technologies. Your assessment of that would be welcomed.

Mr MUNRO—Thank you. Yes, I made it clear when I started that I was going to focus my attention on contemporary commercially proven technologies and describe that to you. What you mentioned is where the real hope for biofuels arises, that technologies can be sufficiently developed and commercially proven to produce ethanol from cellulosic materials of various sorts, whether they be waste agricultural materials or cellulosic materials especially grown for ethanol production, and particularly if they can be grown in conditions where they do not require too much water to be used. Similarly with biodiesel there seems to be some hope of growing crops in somewhat marginal land, and again with little water use. It is within those areas that the prospects for biodiesel and ethanol must improve subject to cost being able to be managed.

The CHAIR—If I could expand that a little more. Have you done any work or read anything in depth on algae?

Mr MUNRO—No. I am aware of the reported material that has been carried out, but no.

Mr THORNLEY—In that same spirit I am keen to hear any insights you have on compressed natural gas as a potential transport fuel.

Mr MUNRO—I will make a few comments. Firstly, natural gas possibly gives the impression of being a natural fuel because of this natural tag it has. It is in fact a fossil fuel. One has to be a little cautious. To that respect it has similarities to petroleum and coal. Natural gas contains about 75 per cent carbon; petrol and diesel somewhere about 83 to 87 per cent carbon; LPG is about 83 per cent carbon, from memory. They are all carbon-containing fuels. There seems to be considerably enhanced interest over recent years in using natural gas in many countries through the world, compressed natural gas, on claims that it is cleaner and the like. I think a deal of that is driven by political interest. There is no doubt that you can run a vehicle on compressed natural gas. It is perfectly possible. It is probably more suited to heavy vehicles than it is to light vehicles. In the case of heavy vehicles there is a compromise that has to be struck. One has to convert or use a spark ignition engine, rather than a compression ignition engine. A compression ignition or diesel engine is thermally more efficient than a spark ignition engine. You lose efficiency by doing that, but you gain the benefit of the somewhat lower carbon content in natural gas by doing that. You do not get all the benefit that might be available from the lower carbon content.

There has been work on a technology to try and use a mixture of diesel fuel and natural gas that gives you largely the benefits of the higher efficiency of the diesel engine and the lower carbon content of the natural gas. By and large it would be recognised that liquid transport fuels are a lot more convenient than gaseous fuels. There may be an arguable case—and I am not sufficiently familiar with this—to submit that natural gas could be converted to a liquid before it is used as a transport fuel, and there are gas to liquid processes that are available. There is some loss of efficiency in doing that but you do get the benefit of a liquid fuel.

Mr THORNLEY—I am implying, from what you have said, that the reduction in greenhouse gas emissions would be very modest. Is that accurate or in terms of greenhouse gas emissions per unit of energy delivered is there only a marginal difference between, say,

gasoline and methane or is there a more substantial difference than the 75 to 83 per cent kind of differential that you mentioned there?

Mr MUNRO—This is in a petrol engine that you are talking about?

Mr THORNLEY—Yes.

Mr MUNRO—The vehicle itself, you can get the benefit of both the lower carbon content in natural gas than petrol, and if you convert or design the engine you can run the engine at a higher compression ratio for natural gas than petrol, which gives you a further efficiency. If you look at the life cycle of this though—and it may change the complexion, I would have to look back at the CSIRO work on that—because you are using energy in compressing the natural gas.

Mr THORNLEY—Yes.

Ms THOMSON—I wanted to ask the question, it seems from what you were saying that the greenhouse gas emissions benefits are better in biodiesel, at least in the short term, and I was wondering about the areas of research that might be undertaken for the longer-term development with engine manufacturers and others in relation to transport, whether you still see that as a longer-term area of benefit rather than ethanol or methane?

Mr MUNRO—It seems to me that vehicle manufacturers are pretty focused on designing engines and vehicles to reduce fuel consumption—that has become something of a priority—and of looking at alternative technologies and fuels that might facilitate this—of course, hybrid cars is one, and the much talked about hydrogen technology is another of these. My impression is that with alternative fuels there is limited scope for reducing carbon dioxide emissions but each of them has to be looked at and evaluated quite carefully. I am not diminishing the role of natural gas, LPG and biofuels. I am rather suggesting that because of the complexities involved in all these there needs to be a comprehensive, across the scene evaluation. It may be in biofuels, which is largely what we are talking about in response to Mr Crisp's question, that the carbon dioxide advantages will be much greater if we can move into cellulosic technology or effective oil seed crops from less productive land.

Ms THOMSON—If you go to the dot points you gave us at page 2 for ethanol blended petrol, dot point 2, Reid Vapour Pressure limits for petrol are not exceeded. You made comment there on volatility limits are set at state level. I thought that was a key point. Would you like to expand on that a little more.

Mr MUNRO—Yes. Let me try and step through the relevant bits here. Photochemical smog in urban areas is caused by the emission of so-called volatile organic compounds, mainly hydrocarbons, and oxides of nitrogen. The oxides of nitrogen come from combustion sources. The volatile organic compounds come from sources like petrol, adhesives and a whole lot of other industrial sources. The photochemical smog is formed when these reach a sufficient concentration in the atmosphere in summer when there is sufficient sunlight and when there is very poor dispersion. This leads to higher levels of ozone at the earth's surface and usually associated with that is reduced visibility. This is quite distinct from the bushfire smoke type of reduced visibility.

Limits have been set on the emissions of the so-called precursors, volatile organic compounds and nitrogen oxides to control photochemical smog, and this had been done very effectively in Victoria, to control smog in Melbourne over the last 20 or 30 years. One of those limits is on the volatility of petrol. This so-called Reid Vapour Pressure is simply the means of measuring and determining this volatility. The Reid Vapour Pressure needs to be set on a regional basis and with regard to time of year. It is not specified under the Commonwealth

Fuel Quality Standards Act because of that spatial and temporal basis. It is specified under legislation under the Victorian Environment Protection Act, and indeed similar acts in other states. There is a maximum limit set.

If one takes petrol that is on specification and simply adds ethanol to it, it increases the Reid Vapour Pressure hence the volatility of the petrol. The volatility goes up. There is an argument been put by some that it really does not increase the photochemical smog because the organic compounds that are released as a result of that are not photochemically terribly reactive, notably ethanol itself. It seems to us that it is not the most desirable way to go to increase the Reid Vapour Pressure over the limit and then grant a waiver of the legislation to respond to that.

Ms THOMSON—In terms of recommendations, would this come in anywhere, those comments you have made? I know it is not in one of your three.

Mr MUNRO—No, it was not.

Ms THOMSON—If I gave you another one, what would you be saying on this?

Mr MUNRO—I would suggest that avenues need to be pursued to try to ensure that ethanol blends can be produced whilst staying in compliance with Reid Vapour Pressure legislation.

Ms THOMSON—Thank you.

Mr CRISP—Would you agree that the best place to do that is in the refinery, as you said in your earlier notes, producing an RON of 88 and then bringing it up to your 91? Can the Reid Vapour Pressure issue be managed best in a refinery?

Mr MUNRO—In my view it can, but it would be something I would suggest you take advice from the oil refiners on as well because there are confounding issues with regard to this. If the oil refiners have to produce a lower vapour pressure petrol blend, which the ethanol is then added as one of the blending stocks, there is arguably a case that there would be an excess amount of butane available that might have to be flared or other markets found for that, (which is undesirable to be going flaring the butane?). Another issue I understand, and this is again without pre-empting the oil refiners, is that the fire-fighting and protection requirements for ethanol are different than that for petrol so there are matters that have to be attended to with regard to the safe storage and fire protection of ethanol.

The CHAIR—You keep raising more and more interesting points, Mr Munro. Thank you very much.

Mr CRISP—We are all very appreciative.

The CHAIR—As I said at the outset, your submission or your company's submission was commented upon before this meeting of how helpful it was. We might be in touch by the telephone. Thank you.

Mr CRISP—Yes.

Mr MUNRO—It would be a pleasure to help. Thank you very much Chair.

The CHAIR—Thank you very much.

Witness withdrew.

Hearing suspended.