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The Secretary
Senate Rural and Regional Affairs and Transport
Parliament House
Canberra ACT 2600

By email to: rrat.sen@aph.gov.au

Dear Sir,

Inquiry into Australia's future oil supply and alternative transport fuels

Thank you for this opportunity to make a submission to the above enquiry. I do apologise for the brevity of this submission, however we were only advised of the inquiry today, which is the closing day for submissions. We would be happy to provide further information in support of this letter as your work progresses.

My company, Enecon Pty Ltd, has worked throughout Australia on studies and projects for the production of energy and co-products from biomass for the past eight years. We have completed more than twenty assignments on this topic over that period, for government and private clients. Work has included:

- The Integrated Tree Processing project in WA. This is a processing facility that makes electricity and activated carbon from whole, coppiced mallee eucalypts.
- A general review of bioenergy for the Australian Greenhouse Office and the Rural Industries R&D Corporation.
- A review of the production of ethanol and methanol from biomass for the Rural Industries R&D Corporation.
- Study and test work for a Queensland company, for use of eucalypts to make ethanol.
- Technology review and planning work for a new Australian business to make bio-oil via pyrolysis.

We therefore wish to comment specifically on the opportunities for alternative transport fuels from biomass feedstocks, such as short rotation eucalypts, municipal wastes and woody weeds.

Technologies

There are several technologies already available to convert biomass into liquid fuels. These have each seen major technical and commercial advancements over the past few years. In the longer term they offer cost reductions that will improve the competitive position of the fuels they produce.

Wood to ethanol

Ethanol is produced via the fermentation of sugars by yeasts and other micro organisms. Ethanol so produced may be concentrated by distillation and then used as a renewable transport fuel. This industry has already reached a major scale in several countries; the combined ethanol production in the United States of America (from corn) and Brazil (from sugar cane) is similar to Australia's entire petrol consumption.

Ethanol is already produced in Australia from the fermentation of low value molasses and starch.

- The sugar that cannot be recovered economically for crystal sugar manufacture is available from sugar mills in C molasses, and this is a suitable feed for ethanol fermentation. However, while C molasses offers a relatively low cost feed and straightforward ethanol production, its availability is limited by the amount produced at Australian sugar mills. If all of the C molasses produced in Australia is used in fermentations, the ethanol produced would probably total between 250 and 300 megalitre/year.

- Starch, present in corn, wheat and other crops, may also be used to produce feed material for fermentations. Starch is a polymer of sugar molecules and if the starch polymer is broken down (via enzymatic hydrolysis) the resulting sugar molecules may be fermented to produce ethanol. The US fuel ethanol industry is based around starch from an integrated, multi-product corn processing industry. In Australia, starch from wheat processing is already used to make fuel ethanol, at Nowra in NSW. As with sugar cane, the use of starch for ethanol production in Australia is focussed on starch produced as a by-product of making higher value products for human consumption. So, while existing feed stocks may be well priced, they are also limited in availability.

The interest in ethanol production from biomass (wood and cellulosic crop residues) therefore comes from the need for a low cost feed material that is available in large, sustainable quantities. Wood contains large amounts of cellulose and hemicellulose. Both these materials are polymers of sugar molecules.

Wood can satisfy the important feed criteria of low cost and large volumes. However the release of sugars from wood is more complex than from starch. Production of ethanol from wood in this way is technically feasible and has been demonstrated extensively in pilot plants in the USA, Europe and the UK. A semi-commercial plant already operates in Canada, using enzymes to hydrolyse straw as feed for fermentation. Work funded by the US government (NREL) over the past few years has resulted in a 30-fold improvement to enzymes used for biomass hydrolysis. There is scope for other significant technical improvements over the next decade to reduce the cost of ethanol made from wood feeds and make it competitive with other fuels.

Gasification for methanol and liquid fuels

Most of the methanol currently produced world-wide is the product of steam reforming to convert natural gas to synthesis gas (a mixture of H_2 and CO) and then catalysis of the synthesis gas to make methanol. It is technically feasible to use gasification to produce a gas stream from biomass that is suitable for catalytic synthesis and production of methanol. The gasification will be somewhat different to existing systems as the composition of the product gases must be optimised for methanol production. The synthesis step may be similar to methanol synthesis from natural gas, albeit at a smaller scale.

Fischer Tropsch processes and other synthesis pathways are also being considered as alternatives to methanol production. Future Energy GmbH and CHOREN Industries GmbH are both working on such technologies at the laboratory and pilot scale in Europe; CHOREN with financial support or interest from companies that include Shell and Daimler Chrysler.

Pyrolysis for liquid fuels, char and chemicals
Fast pyrolysis of biomass converts up to 70% of the dry biomass into oil, with the remaining biomass converted to char and non-condensable gases. The pyrolysis oil is chemically different to the biodiesel produced from agricultural crops such as mustard and canola, and it is not yet a direct substitute for diesel fuels. However, work carried out overseas has demonstrated that pyrolysis oil can be used as fuel in engines when mixed with small quantities of ethanol or with emulsifiers and small quantities of distillate. Work in coming years is expected to confirm the methods for modification or blending of pyrolysis oil so that it may be used as fuel in diesel engines.

Feed Material

In any consideration of a bioenergy project, the availability and consistency of fuel is fundamental.

- Existing plantations, forests and agricultural residues are all sources of biomass, where the energy project must be tailored to fit the wastes available as feed material.

- New plantations can also be a source of biomass. It is hoped that bioenergy will create opportunities for dedicated energy tree crops that have other important environmental benefits. In particular, there is considerable interest in the potential for new tree crops to be planted in agricultural regions across the country to reduce the impact of dryland salinity. In WA, more than 20 million mallee eucalypts are already planted for long term management of dryland salinity in the wheatbelt. Mallees are coppicing trees – they may be harvested regularly, with new growth quickly emerging from the cut stumps. More than 1,000 farmers have already planted mallees, but planting rates will be greatly increased if there are new bioenergy industries seeking long term supplies of biomass and offering the farmers a commercial return for their biomass.

Other Benefits

The International Energy Agency recognises bioenergy as a better form of jobs creation than other major sources of renewable energy. Any of the above technologies will create major, long term rural industries that will:

- Create jobs for the supply, management, harvesting and transport of biomass feed
- Create jobs in country towns to process that feed
- Keep the bulk of operational cash flow within rural communities
- Catalyse environmental tree planting as described above
- Provide farmers with a new cash crop, and a method of improving the sustainability of their other farming practices.

An Australian Problem Requires an Australian Solution

Provided they can be shown to be cost competitive, renewable fuels from biomass offer a huge opportunity for Australia. They also provide greenhouse gas benefits, rural industry and environmental tree planting.

Technologies for all of the processes described above are being commercialised overseas – we do not need to develop them here. What we DO need to do here is to put the best of the world's technologies into an Australian context. We need to understand:

a) the scope of the opportunity
b) how they perform on Australian biomass feed (e.g. eucalypt wood instead of straw or corn stover)

c) how the attendant environmental and community benefits may be integrated into a market –driven system (such and the greenhouse gas benefits embodied in the MRET Renewable Energy Certificates)
d) how to create a stable environment for the large scale investment needed. This requires stable, long term Government policy.
e) The additional industries that will be created (For example: in the USA some one billion dollars has now been spent on commercial processing facilities to manufacture renewable plastics from starch based feeds. A similar industry is possible in conjunction with an Australia bio-fuels industry.)

Thank you again for the opportunity to present these views. We wish you every success with the inquiry.

Yours sincerely,
Enecon Pty Ltd

Colin Stucley
Managing Director