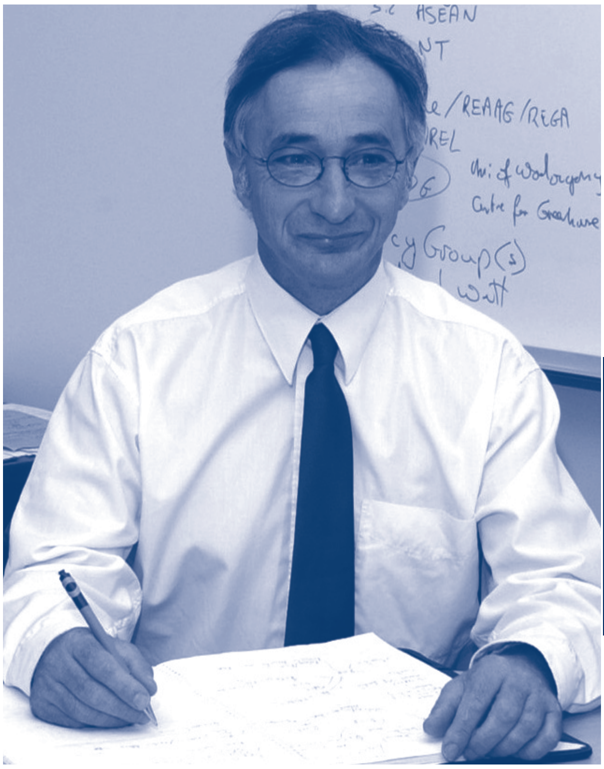
Professor David Harries
DIRECTOR, CENTRE FOR EXCELLENCE INTO ENERGY FOR SUSTAINABLE TRANSPORT, MURDOCH UNIVERSITY & CURTIN UNIVERSITY OF TECHNOLOGY

Still the way to go: biofuels



A few years ago, biofuels were the flavour of the month because their use promised to reduce greenhouse gas emissions and other benefits. Since then, however, some of the public enthusiasm for biofuels has ebbed and many biofuel producers are now struggling. Internationally, questions have been raised on how the use of crops for biofuels could impact on food prices and also the sustainability of biofuel crop production where it involves land clearing. In Australia, a less heated debate has focussed on still quite thorny questions such as what reductions in greenhouse gas emissions and other air-borne pollutants are actually achieved by using biofuels, and how much energy is contained in the biofuels relative to the amount required to produce them. Lack of clarity or even confusion over the benefits of using biofuels has led to doubts regarding the level of funding support the biofuel industry should be receiving.

There are a number of reasons for this. Firstly, the benefits of biofuels, notably the potential to reduce greenhouse gasses, differ from one biofuel to another and from one feedstock to another for the same biofuel. The benefits of using ethanol produced from corn in the USA are much less than those achieved by using ethanol produced from molasses in Australia.

Secondly, the benefits of biofuels are often not calculated on a full life cycle basis. Thirdly, in computing the energy balance of a biofuel, which is the ratio of energy contained in the biofuel to the energy that goes into making it, we need to be aware that we are not comparing apples with oranges. And finally, where a policy is being driven not by just one single issue, but by a number of issues, care needs to be taken in dismissing a policy without considering the full suite of objectives that lie behind the policy.

For example, it takes more energy to produce a litre of ethanol than it does to produce a litre of petrol. However, ethanol produces fewer greenhouse gas emissions per litre when used to displace petrol. Overall, there is a net reduction in greenhouse gas emissions when calculated on a full life cycle basis, with the reduction depending on how the ethanol is produced. If it is produced from the fermentation of wheat, replacing 10% of petrol with ethanol, a blend known as E10, results in a marginal reduction in greenhouse gas emissions per kilometre travelled, whereas if it is produced from molasses, and heat and electricity for the process are produced from burning bagasse, the reduction is over 4%. Replacing 5% diesel with biodiesel, a blend known as B5, reduces greenhouse gas emissions by about 4% per kilometre if the biodiesel is produced from waste cooking oils, but only by 1.5% if made from tallow or canola. These are not large numbers, but we are talking about blends. If higher blends were used, the benefits would increase proportionally.

The benefits of biofuels for local air quality also differ, and depend on population densities. The air quality in the less densely populated Australian cities is often far better than in overseas cities, and consequently the benefits of using biofuels in Australia are not as great. They are nonetheless, significant. In 2000, it was estimated that in Australia pollution from motor vehicles caused per year between 900 and 4,500 cases of illness and between 900 and 2,000 deaths. Further estimates of the economic cost of those health impacts range from about thirty cents per tonne of CO in non-urban areas to over a quarter of a million dollars per tonne of particulate matter (PM) in urban areas.

> Lack of clarity or even confusion over the benefits of using biofuels has led to doubts regarding the level of funding support the biofuel industry should be receiving.

Recently, the Australian Bureau of Agriculture and Transport Economics has attempted to put monetary costs on the value of using biofuels in the Australian context, based on the reductions achieved in local air pollution and greenhouse gas emissions (Cuevas-Cubria, 2009). The study concluded that for E10, a subsidy of between 0.34 c/L and 0.57 c/L could be justifiable, depending on the feedstock, while for B5, a subsidy of between 0.49 c/L and 0.95 c/L could be justified.

These figures represent estimates of the economic costs of reducing local air pollution and greenhouse gas emissions. In using such results to inform policy, however, we need to remember that to compare the energy balances of biofuels with those of petrol or diesel is only meaningful while these are the main fuels used. At some stage, the energy balance of a biofuel will have to be compared to that of other alternative fuels replacing conventional petrol and diesel.

In addition, biofuels could form a part of a solution to a problem that is likely to arise if over the next decade the world oil price significantly rises and at the same time Australia's oil production significantly declines. To avoid a potential blowout in Australia's balance of trade, Australia will need to limit its dependency on oil imports over the coming years. The role that current generation biofuels can play is limited. Other options, including second generation biofuels produced from waste cellulosic materials and from microalgae, will be needed. Those technologies are a number of years away from being commercial but once available it will be important to be able to shift to those fuels as quickly as possible. This will depend on prior experience in the use of biofuels and the systems that are by then in place for using it. It is difficult to put a cost on that important bridging role that first generation biofuels may play but perhaps it is the major reason for supporting the industry.