

## Biofuels – some big questions

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In April last year, I recommended to a Parliamentary select committee that the Biofuel Bill not proceed to become legislation. Biofuels are generally regarded as a renewable form of energy and so this recommendation by a Parliamentary Commissioner for the Environment was unexpected. It was not a decision I took lightly, but it is where the analysis took me.

The Bill was intended to require fuel companies to ensure a certain percentage of their sales are biofuels. The biofuels must be mixed in with conventional fuels – ethanol into petrol; biodiesel into diesel. The establishment of an obligation follows similar legislation in Europe - the European Union's biofuel directive and the United Kingdom's biofuel obligation.

The Bill aimed to reduce our net carbon dioxide emissions and increase the security of energy supply, particularly for transport. The potential effectiveness of the Bill hence should have been judged by its ability to achieve those two aims.

With regard to reducing net carbon dioxide emissions, the original version of the New Zealand Bill allowed any bioethanol or biodiesel to qualify as "biofuel", regardless of its source. But not all biofuels achieve a significant net greenhouse gas reduction.

Lifecycle assessments show that the lifetime CO<sub>2</sub> emissions of biofuels vary greatly by feedstock, production method and country of origin<sup>1</sup>. For instance, bioethanol from American corn is a very poor performer - total CO<sub>2</sub> emissions are close to those of diesel. But biofuels made from wastes like whey, manure, and recycled plant oil can emit up to 80% less carbon dioxide than fossil fuels. This emphasised the need for a lifecycle CO<sub>2</sub> reduction standard.

As to increasing energy security, the Bill guarded against supply failure by allowing the importation of biofuels.

It is now well-known that large-scale plantations of biofuel crops have incentivised the felling of carbon-absorbing rain forests and driven up food prices. Developing a system that allows the import of biofuels while avoiding the harmful environmental and social impacts felt in developing countries will generate high compliance costs.

Further, the importation of biofuels is inconsistent with the "clean green" branding of New Zealand. If our lightly populated country with a workforce skilled in plant growth and processing cannot grow and produce its own biofuels, which country can?

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<sup>1</sup> R. Zah, H. Böni, M. Gauch, R. Hirschler, M. Lehmann, P. Wäger. 2007. A Life Cycle Assessment of Energy Products: Environmental Impact Assessment of Biofuels. Empa, Swiss Federal Institute for Materials Science and Technology. <http://www.theoilrum.com/node/2976>.

At the time of writing, the Local Government and Environment Committee had reported back to Parliament with a range of suggested amendments to the Biofuel Bill. One amendment would lower the obligatory percentage by 2012 from 3.4% to 2.5%.

More significantly, it was proposed that three sustainability principles be added to the Bill. First, biofuels must achieve a net CO<sub>2</sub> reduction of at least 35%; second, they must not use land of high value for food production; and third, they must not reduce indigenous biodiversity.

A further amendment signalled that by-products of food production such as whey and tallow, oilseed crop grown on a rotational basis, and ethanol from sugarcane are all considered acceptable feedstocks because they are considered to be in accord with the three sustainability principles.

I remained concerned about the practicality of implementing and enforcing sustainability standards, particularly overseas. In a former role as chair of Land Transport New Zealand, I became very aware that we are able to confidently import vehicles into New Zealand because the overseas manufacturers have a rigorous documented regime around the standards to which vehicles are manufactured. No such regime of credible certification exists for biofuels.

The issue of second-order effects would be a challenge for implementing the sustainability standards. For instance, while Brazilian sugar cane does not directly displace food crops, other crops and pasture may shift further north as they are displaced by sugar cane.<sup>2</sup>

Biofuels illustrate the need to critically examine the “renewable / non-renewable” energy paradigm that has influenced much thinking about energy since the 1960s. The underlying concept is that of living within flows rather than depleting stocks. Biofuels indeed trap the flow of solar energy, but there is more to be considered in assessing the environmental footprint of an energy source – net greenhouse gas emissions, and effects on soil fertility, biodiversity, and landscape.

It is useful to step back from focusing on biofuels and think about the problems that biofuels are intended to solve.

The fundamental problem is a looming gap between supply and demand. I have spent much of my working life researching how this gap can be closed in part by reducing demand as well as increasing supply.

The amended 2012 target for the biofuel obligation is 2.5% of petrol and diesel. To put this in perspective, it is only slightly larger than the growth in petrol and diesel consumption between 2006 and 2007. The scope for demand reduction, whether through improved efficiency or behaviour change, is not trivial.

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<sup>2</sup> Barber, A., Pellow, G., Aragao Pereira, M. 2008. *The sustainability of Brazilian sugarcane bioethanol - a literature review*. AgriLINK NZ. Prepared for Energy Efficiency and Conservation Authority (EECA). <http://www.eeca.govt.nz/renewable-energy/biofuels/documents/sustainability--brazilian-sugarcane-bioethanol-may-08.pdf>

With regard to energy supply, two challenges stand out, both with a strong connection to climate change. One is transport energy; the other is electricity, particularly peak electricity which is generated by burning coal and gas.

Hybrid plug-in cars, which can run on both electricity and liquid fuel, are one way in which these two supply challenges might be connected in the next decade. Putting it simplistically, we could run cars on electricity in summer and on liquid fuel in winter. With real-time electricity pricing incentivising switching between the two forms of energy, the batteries in hybrid cars could become part of the national electricity storage system, effectively acting as tiny hydro lakes.

We do not think of firewood as a biofuel. But it is. And the decline in heating homes with wood, the trend toward central heating, and the increasing use of heat pumps must increase peak power demand in winter.

What is the best use for this most plentiful of biofuels? Should we use wood in efficient burners to heat our homes, particularly those that are old and draughty? Or should we burn wood in power stations to generate electricity to run heat pumps? Or should we bank on being able to convert wood to ethanol? Or maybe all three?

Conversion of agricultural byproducts like whey, tallow and manure to biofuels will certainly add greatly to our understanding of biofuel technologies, but these feedstocks are small. There is a strong case for waiting for the second generation of biofuels – like wood to ethanol – before we get serious about them. In contrast, we should not delay getting serious about curbing growth in our consumption of transport energy.