



THE OUTLOOK FOR BIOFUELS

Bernard Rice and John Finnan Teagasc, Oak Park Crops Research Centre, Carlow provide an overview of developments in the biofuels sector

The biofuel industry in Ireland has suffered severe turbulence in recent times. Pure plant oil (PPO) production has been hit hard by high rape-seed prices and both PPO and biodiesel markets have been badly affected until recently by 'B99' biodiesel imports from the USA. At present, all biofuel sectors have been affected by the dramatic fall in oil prices and there has also been damaging public debates on the role of biofuels in food price increases, and the sustainability of some biofuel production.

In spite of these problems, some progress has been achieved with the development of four pure plant oil units; the rise of wood chips for commercial heating; the construction of the first significant wood pellet plant in Knocktopher; and, the establishment of approximately 2,000 ha of perennial energy crops.

The recent agreement on an EU Renewable Energy Directive will have a major effect on biofuel developments in Member States over the next 10 years. In the new Directive, the target to produce 20 per cent of our total energy from renewable sources by 2020 has been retained.

The transport target has been modified to the achievement of the 10 per cent target from all renewable sources, not solely biofuels. The extent to which this alters the biofuel target depends largely on the progress made with electric cars

charged from renewable non-bio electricity.

The first test of Member States reactions to the Directive will be in their submission of National Action Plans (which are to be submitted by June, 2010) in pursuit of the Directive targets. Before trying to formulate the National Action Plan for Ireland, it is essential that we clarify what we want it to achieve. The following objectives are proposed:

- to achieve a rate of substitution of biofuels into the transport fuel market approximating to the substitution required by EU Directives;
- to provide an opportunity for native raw material producers and processors to maximise home production and processing;
- to incentivise farmers to use biofuels to supply their own fuel needs;
- to provide a platform on which second-generation biofuel technologies can be built;
- to minimise the cost to exchequer (i.e., tax-payer) and motorist;
- to maximise fuel supply security benefits;
- to maximise greenhouse gas benefits; and,
- to minimise the disruption of food production.

The action plan will have to address the reality that



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achievement of Directive targets will require the use of biomass on an increased scale: four million tonnes of energetic biomass, as opposed to our present use of well short of one million tonnes.

Do we need Irish biofuel industries based on current technologies? Yes, for a number of reasons:

- oil prices are currently very low, but they will rise again as economies come out of their present slump;
- existing food market prices are very volatile - alternative markets would have some stabilising effect;
- the costs and sustainability of biofuel imports will be recurring issues;
- the need to generate rural employment is once again with us; and,
- failure to meet EU targets will eventually lead to substantial penalties.

Transport biofuels

Obligation system to replace excise relief

A significant recent Irish policy development was the publication of a Government discussion paper proposing an obligation system on oil companies as an alternative to the current excise relief system. The support mechanism proposed is the issue of certificates per unit of biofuel placed

on the market, and an obligation on fuel suppliers to redeem certificates to match their mineral fuel sales at the specified substitution level for that period.

Although the policy document recognises the role that biofuels could play in providing Ireland with an emergency fuel supply, it is disappointing that the many other benefits that would accrue from native biofuel production are not acknowledged.

The arguments against biofuels

The obligation document lists the issues that have been used to tarnish the image of biofuels in recent times: little or no reduction of carbon emissions; raising of food prices; and, damage to vulnerable ecosystems. While these are legitimate concerns on a global scale, they have little relevance to current or planned Irish biofuel production. The food-fuel argument has already collapsed, with a small increase in grain production leading to a rapid fall in prices and grower profit margins. With cattle numbers projected to fall, and pig and poultry production under threat, Irish cereal growers will need new markets just to sustain their current production area. A big increase in our tilled area to produce arable biofuel crops will not happen. Irish biofuel production can actually assist food production by maintaining the tillage area and promoting the production of animal protein feed (DDGS, rape cake, etc.).

Greenhouse gas (GHG) mitigation by transport biofuels

On greenhouse gases, the EU Renewable Energy Directive is proposing an emission reduction of at least 35%, increasing to 50% in 2017, for any transport biofuel to count towards national target achievement. One of the strengths of the biofuel production either in place or planned in Ireland to date, is its high level of sustainability:

Biodiesel production by Green Biofuels, Ecoola, Eco Fuels and Greyhound Recycling is mainly from recovered vegetable oil (RVO) and tallow. Biodiesel produced from rape-seed oil (RME) would reduce emissions by more than half.

Pure plant oil emissions can be estimated at 55-60 per cent of those compared with diesel.

For ethanol, Carbery Milk are producing from whey, a by-product feedstock, so it is probably safe to assume that their GHG emission is over 60% less than petrol. Inefficient corn-ethanol plants may well produce emissions similar to petrol but no such plants exist here. Ethanol Ireland is currently working on plans to build a substantial wheat-to-ethanol plant in Waterford port. A modern efficient plant as proposed, using CHP and possibly a renewable source of plant energy as well as capturing the CO² emitted during fermentation, could achieve a GHG reduction of up to 70 per cent.

While second generation biofuels have the potential to increase biofuel production per ha, their GHG emissions will not be much better than the current Irish plants. If, or when second generation technologies become commercially viable, Ireland will still have a challenge developing low-cost biomass supplies for such plants.

There is an opportunity for Ireland to develop a scheme that rewards sustainable production, regardless of feedstock, technology or generation. Certificates should be allocated in proportion to certified greenhouse gas abatement, above a minimum abatement level of 35 per cent. This certification process should include feedstock traceability.

Certificate trading

The whole basis of the obligation/certification system is dependent on the effective operation of a certificate trading system in which the certificates attain a value close to the fossil fuel excise and the buy-out penalty. The early stages of CO² trading have provided an example of what can go wrong with this type of market. Any monies collected as penalties should be used to top up the certificate price, as in the UK RTFO scheme.

All the biofuels for which certificates are issued should be in compliance with the most appropriate quality standard, e.g. EN14214 for biodiesel. Other biofuel support measures should not be forgotten. On the feedstock side, the carbon premium and top-up payment need to be maintained as far as possible. On the market side, conversion of public vehicle fleets to use biofuels; capital grants for processing; distribution and dispensing facilities; have all helped to increase the appeal of biofuels to the motorist.

Heating and electricity production

There are many different heat/electricity market opportunities for biomass feedstocks, either already developing, or still to find a niche:

- The use of pellets for home heating was kick-started by the

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Closing Date for Applications is July 31st 2009

Further information is available from:
Ms Mary Curley, Tel: 01-4024650, E-mail: mary.curley@dit.ie
or
Mr Michael Farrell, Head, Department of Electrical Engineering, Tel: 01-4024874, E-mail: michael.farrell@dit.ie

boiler/stove grants available under the SEI Greener Homes Scheme.

- The heating of commercial buildings, mainly hotels, by wood-chip boilers has been advancing steadily, with up to 100 installations either operating or approved for SEI ReHeat Scheme grants. New installations however, are being delayed by the uncertain economic climate.
- The open-fire and hand-fed stove market is still substantial and it is largely supplied by log-wood and briquettes. From the SEI annual energy balance, it appears that the domestic peat briquette market is equivalent to about 150,000 tonnes of dry biomass.

The 30% peat substitution target set out in the Government's White Paper for the three peat-burning stations would require biomass to replace about 0.9 million tonnes of peat. Assuming net calorific values of 8 MJ/kg and 12 MJ/kg for peat and biomass respectively, about 0.6 million tonnes of biomass would be required to meet this target.

The Government White Paper also contains a 2020 target of 800 MWe of electricity "with an emphasis on biomass-fuelled CHP". Even half this target would require about two million tonnes of biomass.

Feedstock options

Pellets at the Balcas plant are produced from sawmill residues: the D-Pellets plant is using forest thinnings. If/when these feedstocks become less available, the next possibilities are miscanthus, or by-product materials such as cereal or rape straw or rape-seed cake. Their suitability as fuels would all be, to some degree, inferior to wood, so they are more likely to be used in bigger commercial boilers. In the event of a lack of wood-chip availability for commercial boilers, willow chips or miscanthus in pelleted or chopped form would appear to be the best alternatives. Pelleting is a substantial additional cost, but greatly simplifies handling. Peat stations are likely to meet as much as possible of their needs from by-product or residue materials, and use energy crops as a top-up. The principal candidate energy crops are miscanthus and willow, with hemp as a possible annual alternative. Miscanthus and willow are both perennial crops with an expected lifetime of up to 20 years. Both are expensive to establish but are supported by Department of Agriculture, Forestry and Food establishment grants. The earliest miscanthus plantation established at Oak Park is currently in its 15th year. No serious incidence of disease has been recorded during this period, and although on light land, it still has a harvestable yield over 10 t/ha of dry matter in good years. Very little fertiliser has been applied during this period and initial N fertilisation trials have shown only a modest response. It is, however, expected that crops grown on some soils will require regular fertilisation.

Rust infestation was a problem in earlier Teagasc trials of willow, but it is expected that plantations will last up to 20 years and longer if a mixture of modern rust-resistant varieties is sown. Harvesting and processing are more expensive than miscanthus, with drying a particular problem. A simple, inexpensive farmyard drying system has been developed at Oak Park for drying willow chips to 20% moisture or lower over the summer months. The high establishment costs of these crops will be a continuing

problem, and ways of reducing them must be found before the grants are reduced or phased out.

Biogas

Anaerobic digestion (AD) potential in Ireland remains untapped. Grid connection and planning problems, along with difficulties finding nearby heat uses, and constraints for animal health reasons on the land-spreading of food waste digestate, all are combining to hamper progress. Yet AD offers the best prospect for small-scale CHP, and it could make some contribution to the White Paper 800 MWe target. Biogas has the potential to be used in several different ways:

- In boilers or CHP plants, with minimal upgrading;
- As transport fuel, after upgrading and with some vehicle modification;
- Injected into the gas grid, again after upgrading; and,
- As a fuel cell driver; this is still at a development stage, and fuel cell selection and feedstock upgrading are still in need of research.

Research is urgently needed on the economics and practicalities of digesting grass and other energy crops along with animal manures, on the techniques, cost and scale economy of biogas upgrading processes, and on the state of development of the use in fuel cells of hydrogen-rich gases such as bio-methane. Φ



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Further information is available from:
Dr Fergal Boyle, Programme Chairman, Tel: 01-4023813, E-mail: fergal.boyle@dit.ie
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The deadline for the receipt of applications is July 31st 2009