SUSTAINABLE ENERGY IRELAND

FACT SHEET

Liquid Biofuels for Transport

The Biofuels Directive (2003/30/EC) defines biofuels as "liquid or gaseous fuel for transport produced from biomass". It requires Member States to "ensure that a minimum proportion of biofuels and other renewable fuels" are "placed on their markets". Reference targets, "calculated on the basis of energy content of all petrol and diesel for transport purposes placed on their markets", are proposed in the Directive.

The Minister for Energy Eamon Ryan issued a consultation paper on the introduction of a biofuels obligation scheme in October 2008 and proposed therein that the 2010 target be reduced from 5.75% to 3% by energy (4% by volume). This proposed change arose due to growing concerns regarding the impacts of current biofuels development on food prices, food security and sensitive ecosystems coupled with the low greenhouse gas emissions benefits of some energy (and emissions) intensive biofuel production processes.

The targets are as follows:

3% by 31st December 2010
10% by 31st December 2020.

It attaches an important issue: The biofuels must come from sustainable sources.

Biofuels in Ireland must be entirely compliant with EU Sustainability Criteria, which are currently being finalised. These will set out stringent conditions which fuels must meet before they can be considered as contributing to the EU targets, including:

- a minimum level of greenhouse gas savings
- biodiversity requirements to prevent certain lands such as natural forests and protected areas being used in the production of biofuels
- social reporting obligations on the Commission

The essential aim of these criteria is to ensure that biofuels used within the EU do not result in adverse consequences for societies and the environment globally. They will also encourage the next generation of biofuels and support investment in cleaner and more sustainable types of transport fuels.

There was a significant increase in the share of transport energy from biofuels in 2007 in particular, albeit from a low base. Biofuels accounted for 0.5% (in energy terms) of petrol and diesel sales in 2007, growing from 0.1% in 2006.

In addressing the intent of the Directive, options for Ireland based on existing technologies include pure plant oil and biodiesel as substitutes for mineral diesel, bioethanol as a substitute for petrol, and Biomethane as a substitute for gas vehicles.

Benefits of Biofuels

Biofuels derived from biomass produced in Ireland address important policy areas:

Energy – contribute to security of supply and the development of indigenous renewable energy sources.
Environmental – contribute to greenhouse gas emission reduction and waste management. On a life cycle analysis basis the use of biofuels typically results in greenhouse gas emissions reductions of approximately 50% compared to that from the displaced fossil fuel.
Agricultural – offer new opportunities for farmers in the context of CAP reform.
Social – contribute to employment generation in rural areas and enhancement of local economies.

Pure plant oil (rapeseed oil)	Parameter	value	Unit	Comment
Pure Plant Oil (PPO) is produced by pressing oilseeds from f.ex. oilseed rape (OSR) and filtering the resulted oil. Other oils like soya or palm oil are also possible feedstocks. The oil can be used as a fuel in a diesel engine whose engine has been fitted with an appropriate modification kit with a typical costs including installation of app. 4.000 – 6.000 € .	Feedstock, input	rapeseed		other oil plants also possible
	Assumed yield rapeseed	3.4	t/(ha a)	
	Oil content rapeseed	40 - 43	%	
	Fuel yield per ha and year	1480	l/(ha a)	
	Biomass to produce 1 litre	2.3	kg	
	Yield Biofuel per t input	450	l	
	Calorific value	37	MJ/kg	at 20°C
		34	MJ/l	
	Fuel-equivalent	0.96	l	1 litre rapeseed oil substitutes 0.96 l of Diesel
	Yield of fuel-equivalent	1420	l/(ha a)	
	Energy yield biofuel	51	GJ/(ha a)	
	Viscosity	74	mm2/s	at 20°C
	Cetane-number	40		
	Flashpoint	317	°C	
	Density	0.92	kg/l	at 15°C

Biodiesel	Parameter	value	Unit	Comment
Biodiesel is produced from pure plant oil, recovered vegetable oil or beef tallow. These feed materials are converted by a trans-esterification process, which involves the use of methanol. Biodiesel which meets the standard EN 14214 can be blended with mineral diesel in a mix of up to 5% biodiesel and used as a fuel in standard diesel vehicle. Greater blends may be used in engines which have been approved for such use by the manufacturers.	Feedstock, input	rapeseed		refinery process; other inputs like oil plants or animal fats are also possible
	assumed crop yield	3.4	t/(ha a)	
	Oil content rape seed	40 - 43	%	
	Fuel yield per ha and year	1550	l/(ha a)	
	Biomass to produce 1 litre	2.2	kg	
	Yield Biofuel per t input	455	l	
	Calorific value	37	MJ/kg	at 20 °C
		32	MJ/l	
	Fuel-equivalent	0.91	l	1 litre Biodiesel substitutes 0.91 l of Diesel
	Yield of fuel-equivalent	1410	l/(ha a)	
	Energy yield Biofuel	51	GJ/(ha a)	
	Viscosity	7.5	mm2/s	at 20°C
	Cetane-number	56		
	Flashpoint	120	°C	
	Density	0.88	kg/l	

Abbreviations			
%	percentage	kg	kilogram
<	lower	km	kilometre
>	greater	l	litre
°C	degree celsius	M	Mega
a	annum = year	m3	cubic-meter
app.	approximately	MJ	Mega joule
deg.	degree	mm2	squaremillimeter
DM	dry matter	OSR	Oil Seed rape
G	Giga	PPO	Pure Plant Oil
GJ	Gigajoule	s	second
ha	hectare	t	tonne
J	Joule		

Bioethanol (wheat)	Parameter	value	Unit	Comment
Bioethanol is produced fom sugar beet and wheat through a process of hydrolysis, fermentation and distillation. Bioethanol can be blended with petrol in a mix of up to 5 % and used as a vehicle fuel in a standard vehicle. Greater blends of bioethanol are also possible where the resulting mixture is used in flexible fuel vehicles.	Feedstock, input	wheat		input and yield per ha can vary
	Assumed crop yield	8.0	t/(ha a)	
	Fuel yield per ha and year	2848	l/(ha a)	
	Biomass to produce 1 litre	2.6	kg/l	
	Yield Biofuel per t input	356	l	
	Calorific value	27	MJ/kg	at 20°C
		21	MJ/l	
	Fuel-equivalent	0.65	l	1 litre Bioethanol substitutes 0.65 l of petrol
	Yield of fuel-equivalent	1850	l/(ha a)	
	Energy yield biofuel	60	GJ/(ha a)	
	Viscosity	1.5	mm2/s	at 20°C
	Cetane-number	8		
	Octane-number	>100		
	Flashpoint	<21	°C	
	Density	0.79	kg/l	

Bioethanol (sugar beet)	Parameter	value	Unit	Comment
Bioethanol is produced from sugar beet and wheat through a process of hydrolysis, fermentation and distillation. Bioethanol can be blended with petrol in a mix of up to 5 % and used as a vehicle fuel in a standard vehicle. Greater blends of bioethanol are also possible where the resulting mixture is used in flexible fuel vehicles.	Feedstock, input	sugar beet		
	Assumed crop yield	45	t/(ha a)	
	Fuel yield per year	4050	l/(ha a)	
	Biomass to produce 1 litre	9.3	kg/l	
	Yield Biofuel per t input	90	l	
	Calorific value	27	MJ/kg	
		21	MJ/l	
	Fuel-equivalent	0.65	l	1 litre Bioethanol substitutes 0.65 l of petrol
	Yield of fuel equivalent	2633	l/(ha a)	
	Energy-yield biofuel	85	GJ/(ha a)	
	Viscosity	1.5	mm2/s	at 20°C
	Cetane-number	8		
	Octane-number	>100		
	Flashpoint	<21	°C	
	Density	0.79	kg/l	

Biomethan (maize-silage)	Parameter	value	Unit	Comment
Biogas (methane content ca. 55 %) can be upgraded to Biomethane with a Methane content greater 96 %. Biomethane can be used in gas-vehicles as a fuel without modification of the engine.	Feedstock, input	Maize-silage		other Energy crops, slurry, organic waste also possible
	Assumed crop yield	45	t/(ha a)	
	Biogas yield from fresh material	200	m3/t	55% methane in biogas, Maize 32 % dry matter content
	specific weight, density	0.72	kg/m3	kg/m3 Biomethane
	Methane-yield per ha and year	4950	m3/(ha a)	55% methane in biogas
		3564	kg/(ha a)	
	Biomass to produce 1 kg fuel	13.0	kg	
	Calorific value	50.0	MJ/kg	Methane at 20°C
		36.0	MJ/m3	
	Fuel-equivalent	1.54" (1.11*)	kg/l; (m3/l)	1 kg (1 m3) Methane substitutes 1.54 l (1.11 l) unleaded petrol
	Yield of fuel equivalent	5488	kg/(ha a)	
	Energy yield biofuel	178	GJ/(ha a)	
	Viscosity	-		
	Cetane-number	-		
	Octane-number	130		
	Flashpoint	-		
" = methane in kg				
* = Methane in m3				

Abbreviations			
%	percentage	kg	kilogram
<	lower	km	kilometre
>	greater	l	litre
°C	degree Celsius	M	Mega
a	annum = year	m3	cubic-meter
app.	approximately	MJ	Mega joule
deg.	degree	mm2	squaremillimeter
DM	dry matter	OSR	Oil Seed rape
G	Giga	PPO	Pure Plant Oil
GJ	Gigajoule	s	second
ha	hectare	t	tonne
J	Joule		

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