

Biofuel implementation agendas

A review of Task 39 Member countries

A REPORT TO IEA BIOENERGY TASK 39

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Report T39-P5 10 May 2007

Full Citation

Neft, J., van Thuijl, E., Wismeijer, R. and Mabee, W.E. (2007). *Biofuel implementation Agendas* IEA Task 39 Report T39-P5, 52 pp.

Executive Summary

Biofuels for use in the transportation sector have been produced on a significant scale since the 1970's, using a variety of technologies. The biofuels widely available today are predominantly sugar- and starch-based bioethanol, and oilseed- and waste oil-based biodiesel, although new technologies under development may allow the use of lignocellulosic feedstocks. Measures to promote the use of biofuels include renewable fuel mandates, tax incentives, and direct funding for capital projects or fleet upgrades. This paper provides a review of the policies behind the successful establishment of the biofuel industry in countries around the world. The impact of direct funding programs and excise tax exemptions are examined using the United States as a case study. It is found that the success of five major bioethanol producing states (Illinois, Iowa, Nebraska, South Dakota, and Minnesota) is closely related to the presence of funding designed to support the industry in its start-up phase. The study concludes that successful policy interventions can take many forms, but that success is equally dependent upon external factors which include biomass availability, an active industry, and competitive energy prices.

Brazil is one of the world's largest bioethanol producers. Brazil produces bioethanol from sugar- or starch-based material in the form of sugar cane and sugar cane residues. Because of Brazil's optimal climate, two seasons of sugarcane growth can be achieved, adding greatly to the potential production of both sugar and bioethanol products. In response to the first oil crisis of the 1970's, Brazil invested heavily in fuel alcohol primarily as a means of increasing fuel security and saving foreign currency on petroleum purchases. Today, Brazil controls more than 75% of the world's export market, with primary exports going to the USA, Europe, Korea, and Japan; Brazil's estimated total exports will be approximately 3.1 billion litres in 2006¹. Many countries, including Japan and members of the European Union, have made Brazilian bioethanol a part of their renewable fuel strategies.

In the United States, the drivers for the industry were in part the rapid surges in global oil prices experienced in the 1970's and 1980's, which led to rising prices of fuel. There was and is also the presence of a strong agricultural lobby which is interested in creating additional revenue streams for farmers. The US bioethanol industry uses corn, and to a lesser extent wheat, as a feedstock for wet- and dry-milling processes. A number of different policy options have been employed to help build the industry. Both federal and state governments have offered the industry direct funding in the form of public-private partnerships and research funds, as well as tax incentives and state-level renewable fuel mandates, i.e. legislated amounts of renewable fuels contained in fuel sales within the state, defined by blending level or by renewable fuels [22, 23]. US production of biofuels is significant with capacity of over 19 billion litres in 2006, but today only comprises about 2.6% of liquid fuel consumption. In order to become a more significant component of the transportation fuel sector, biofuel production must grow tremendously, which will require access to cellulosic biomass. The Advanced Energy Initiative includes the Biorefinery Initiative, which sets a goal of making cellulosic bioethanol cost-competitive by 2012 and which provides significant funding to achieve this goal (US \$91 million in 2006, US \$150 million in 2007)². Most recently, the USDOE announced significant funding of up to US \$385 million to fund six cellulosic ethanol plants across the United States. In February 2007, British Petroleum announced that the BP Energy Biosciences Institute, a US \$500 million investment over 10 years, would be headquartered in the USA at UC Berkeley.

In the European Union, the primary policy tool behind the development of a bioethanol industry is the Directive on the promotion of the use of biofuels for transport (Directive 2003/30/EC)³. The motivations behind this Directive include improving the security of energy supply, and reducing the environmental impact of the transportation sector. The Directive sets reference values for an

¹ F.O. Lichts (2006) World Ethanol & Biofuels Report 5:48

² US Gov (2006) Advanced Energy Initiative. National Economic Council, Washington DC, USA

³ EC (2003) Promotion of the use of biofuels and other renewable fuels for transport. Directive 2003/320/EC. OJEU L123, 17 May 2003. Brussels, Belgium

increasing share of biofuels from 2% of total fuel supply in 2005 to 5.75% of total fuel supply in 2010 (based on energy content) in order to meet these priorities. Currently the European Commission considers, as part of reviewing the Directive, to set a binding target of 10% biofuels by 2020. Due to relatively slow growth in the industry, it is currently anticipated that renewable fuels will occupy about 4.8% of the market by 2010, which is significantly less than the existing policy target. Many member states have passed the biofuels Directive into national law, including Belgium⁴, the Czech Republic⁵, France⁶, Germany⁷, Greece⁸, Latvia⁹, Lithuania¹⁰, Sweden¹¹ and The Netherlands¹². A parallel Directive was created in order to restructure the community framework for the taxation of energy products and electricity (Directive 2003/96/EC), allowing excise-tax exemptions for biofuels produced or blended within European countries¹³. Today, most EC member states, including Austria, Belgium, Cyprus, Denmark, Estonia, France, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Slovakia, Slovenia, Spain, Sweden and the United Kingdom have introduced exemptions at various levels up to 100%, using the precepts laid down in Directive 2003/93/EC.

As of late 2005, only one country exceeded the goals set out in the Directive. German biofuel use (primarily biodiesel) accounted for 3.75% of total fuel consumption in 2005⁷. Swedish biofuel use (primarily bioethanol) accounted for 2.2% of the total in the same year, which came closest to achieving the goal¹¹; however, since most cars in Sweden are now running at E5 bioethanol blends, the country has encountered a constraint in the form of the EU Directive on Fuel Quality, which limits renewable fuel blends to 5%. Other countries, including the United Kingdom, have identified this Directive as a barrier to achieving the goals of the Directive on Biofuel Use. In France, about 1.2% of fuel sales consisted of renewable fuels in 2005, mostly in the form of bio-ETBE or bioethanol. In Austria, biodiesel production had reached almost 100 million litres, which is approximately 1.1% of national fuel consumption¹⁴. Spain used significant amounts of both bioethanol (1.49% of total petrol) and biodiesel (0.10% of total diesel)¹⁵. Most European Union members had not yet reached their biofuel use goals under the biofuel Directive in 2005, although the situation is changing rapidly as new capacity comes on-line.

Other major biofuel producers include China, which has grown its bioethanol production sector rapidly since 2000 to become the third-largest single bioethanol producer after the United States. Total capacity from four plants in 2005 was about 1.3 billion liter. A country poised to be a major biofuel producer is Canada, which currently produces about 250 million litres annually¹⁶. Much of the funding being made available to fund research and development in biofuels in Canada has depended upon the federal government's environment strategy. This strategy has evolved significantly with the ascension of a Conservative minority federal government in 2005, who made a campaign promise to introduce a 5% biofuels mandate.

From this review, it is clear that successful policy options to support biofuel implementation may take a number of forms, including targets and mandates, exemption of biofuels from national

⁴ Anon (2006) Progress report on the promotion of biofuels in Belgium in 2006. Federal Public Service of Finance, Brussels, Belgium

⁵ Anon (2006) Report for 2005 by the Czech Republic for the European Commission on the implementation of Directive 2003/30/EC. Memorandum SN 3231/06. Prague, Czech Republic

⁶ Deguen L (2005) Promotion de l'utilisation de biocarburants (directive 2003/30/CE).

⁷ Neumann L (2006) Third national report on the implementation of Directive 2003/30/EC. Federal Ministry of Food, Agriculture and Consumer Protection, Berlin, Germany

⁸ Anon (2004) 1st national report regarding promotion of the use of biofuels or other renewable fuels for transport in Greece. Ministry of Development, Athens, Greece

⁹ Anon (2006) Report pursuant to Article 4(1) of Directive 2003/30/EC. Riga, Latvia

¹⁰ Anon (2006) Report on measures encouraging the use of biofuels and other renewable resources. Vilnius, Lithuania

¹¹ Guldbbrand L (2006) Report pursuant to Directive 2003/30/EC. Memorandum M2006/2879/E. Stockholm, Sweden

¹² Anon (2006) Besluit biobrandstoffen wegverkeer 2007, Staatsblad van het Koninkrijk der Nederlanden, 2006, 542.

¹³ EC (2003) Restructuring the Community framework for the taxation of energy products and electricity. Directive 2003/96/EC. OJEU L283, 31 October 2003. Brussels, Belgium

¹⁴ Salchenegger S (2005) Biofuels in the transport sector in Austria: 2005. Federal Environment Agency, Vienna, Austria

¹⁵ Anon (2006) Report by the Directorate-General for energy policy and mines regarding Article 4(1) of Directive 2003/30/EC. Ministry of Industry, Tourism and Trade, Madrid, Spain

¹⁶ CRFA (2006) Canadian Renewable Fuel Statistics. Canadian Renewable Fuels Association, Ottawa ON, Canada. Available online at www.greenfuels.org.

excise taxation schemes, direct government funding of capital projects to increase capacity or upgrade distribution networks, or consumption mandates for government or corporate vehicle fleets. These policies can be differentiated by their relative emphasis on government, industry, or consumer actions. In most biofuel-producing countries examined here, a number of policies have been enacted in order to develop industrial capacity and encourage consumption. It is very difficult to measure the individual success of these policies because of the synergistic effects that multiple policies may have.

In the United States, direct funding and support may be seen to play a much more positive role in the national biofuel implementation agenda. Strong funding for establishment of facilities, including all aspects of research, development and deployment, is present in each of the states where significant bioethanol production was present. In advising other governments on the creation of policy to support biofuel implementation agendas, the US experience offers some valuable lessons to consider. The bioethanol industry has been more successful in meeting social criteria such as rural employment. The ability of the industry to increase energy security, on the other hand, has been limited by the relatively small capacity of their production facilities at the current time. This should serve as a cautionary measure for governments in both Canada and the European Union, which have invested biofuel-related policy with more emphasis on the environment and on energy security than they have upon social or economic concerns. Improved energy security through biofuel production can only be achieved when enough capacity is brought on-line. Thus, security-related policy geared to the short-term cannot succeed to any great extent. Policymakers must realize that, in the immediate future, the goals of most successful policies will be related to the economy, and perhaps to the environment. The implication here is that security-related policy, such as mandated renewable fuel use, is likely to take the form of long-term programs that have very little immediate reward.

The experiences gained in developing bioethanol capacity, using both sugar- and starch-based processes, contain many lessons for other biofuels, including biodiesel and the lignocellulose-based bioethanol industry. These fuels can be seen as a response to a variety of domestic issues, including the need to diversify local economies, increased concerns over environmental damage associated with fossil fuel use, and a growing security rationale for a shift to domestic fuel sources. The emerging industry, including the lignocellulosic-based sector, may in turn find opportunities for strategic linkages and partnerships that capitalize upon these political issues. Our findings indicate that successful implementation agendas can take many forms, but that success measured as biofuel production capacity is equally dependent upon external factors which include feedstock availability, an active industry, and competitive energy prices. It is important that policies be crafted that reflect 'realistic' use scenarios for bioethanol and other biofuels over future timeframes.

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1 Austria

1.1 Introduction

The share of renewable energy sources has permanently been rising since the 1970s and finally amounted to 22% of total final energy consumption in 2004. The most important part in the mix of renewable energy sources has always been hydropower (share of 9.4% basing on the alpine region and a great number of run-of-river power stations situated on the Danube. In comparison with other EU Member States, Austria is ranking on the first place according to the use of renewable energy sources in the generation of electricity because of the large use of hydropower. Other sources of renewable energy are for the most part covered by fuel wood (share of 4.4%) and biogenic heating fuels and biofuels for transport (5.5%).

1.2 Main drivers for biofuels policy

Following the Kyoto Protocol, which requires Austria to reduce its greenhouse gas emissions by 13% with 1990 as a reference during the period 2008-2012, the *“Austrian Climate Strategy 2010”* was developed in 2002. With this program an annual reduction of 17 million tonnes of CO₂-equivalents should be achieved. It includes a wide range of measures in all relevant sectors; space heating and transport measures account for more than 50% of the total projected emission cuts. Additionally, joint implementation, clean development mechanisms and international emission trading are expected to reduce further emissions of about 3 Mt of CO₂-equivalents by the first Kyoto period.

1.3 Biofuels policy

Biofuel targets

The EU Biofuels Directive, which provides for the mandatory use of biofuels in the transport sector, was transposed into Austrian national law in November 2004. Austria is aiming to achieve the biofuel targets indicated in the Table below (for more information, see ‘Biofuel obligations’). For reaching the objective to replace 5.75% of fuels with biofuels in Austria, up to 14.6 PJ of biofuels should be on the market by 2010, requiring about 482,000 tonnes of biodiesel and 150,000 tonnes of bioethanol.

Percentage by energy

Table 1.1 - Biofuel targets (% by energy)

Target year	Petrol	Diesel	Petrol + Diesel
2005			2.5% by 1 April
2006			
2007			4.3% by 1 April
2008			5.75% by 1 April
2009			
2010			5.75%

Excise duty reductions

In 1999, an amendment of the Austrian tax law was published according to which there is no mineral oil tax anymore on biodiesel and bioethanol. The *“Austrian Decree on Transportation Fuels”* allows blending up to 3% biodiesel with fossil diesel. Blends more than 5% in gasoline are taxed in full amount. Also if the biodiesel produced in small-scale plants is exclusively used in the farms themselves, it is free of mineral oil tax.

Together with the amendment to the Fuels Ordinance in 2004, the Mineral Oil Act has been revised (*Mineral Oil Tax Law, BGBl. I Nr 180/2004*). Accordingly, tax concessions will now be granted for fuels with a biofuel share of at least 4.4%. However, to be able to benefit from the tax concessions, the fuel must also be sulphur-free (less than 10 mg sulphur per kg of fuel). The use of pure biofuels as fuel is exempted from mineral oil tax since 1 January 2000.

Table 1.2 - Excise duty reductions (€)

Mineral oil taxation for motor fuels	From 1.10.2005	By 30.9. 2007	From 1.10.2007
Diesel	0.325 €		
Diesel with 4,4% biodiesel	0.297 €		
Normal petrol		0.432 €	0.445 €
Super		0.504 €	0.517 €
Normal petrol with min. 4,4% ethanol			0.412 €
Super with min. 4,4% ethanol			0.484 €

Source: www.biomasseverband.at, Basisdaten Bioenergie Österreich 2006

Biofuel obligations

The "Fuels Ordinance" of 1999 defines technical specifications for motor fuels as well as substitution regulations for biofuels, primarily with regard to environmental aspects. In the following amendment on 30 December 1999, biodiesel is specifically defined as FAME (fatty acid methyl ester) with sulphur content up to 0.003 mg/kg. It is allowed to use FAME as a blending component up to an amount of 3% (volume) to diesel fuel. Biodiesel has to be produced exclusively out of vegetable oils.

On 4 November 2004, the Biofuel Directive was transposed into Austrian national law with an amendment to the Fuel Ordinance of 1999. This amendment stipulates that all companies putting fuels on the market (e.g. OMV, Österreichische Mineralöl-Verwaltung) must, from 1 October 2005, replace 2.5% of the total energy quantity by biofuels. From 2007, this percentage will be increased to 4.3%, and in 2008 the target of 5.75%, as stipulated in the Directive, should be achieved. The term "committed to substitution" comprises everybody or every enterprise that introduces Otto or Diesel fuels within the federal territory, or brings them into the federal territory, except in the fuel container of the vehicle. Persons subject to the substitution requirement are therefore those who place petrol and diesel fuels on the market for the first time in Austria.

Fiscal incentives

Not available

Investment subsidies

Not available

Other measures stimulating the implementation of biofuels

Platform stimulating the use of biogas for transport:

In Austria about 600 natural gas cars are in use up to now. A new platform "Biogas-CNC Transport" has been founded in 2006, consisting of several partners like OMV, klima:aktiv biogas, the Chamber of Agriculture of Austria and the Austrian Biomass Association. The target of this platform is to enlarge the use of biogas, produced by gasification, as component in transport fuels (20%) in 100,000 cars by 2013. Tax reductions by 2020, like the reduction of the VAT to 10% or a mineral oil exemption, should be one of the factors that make this program successful. New natural gas / biogas filling stations will be built. Currently only 31 stations offer compressed natural gas as fuel, 200 should be the final number in 2010 where the new mixture of CNG / biogas will be offered.

Promotion of second generation biofuels

R&D work on synthetic biofuels is carried out mainly on the R&D research platform in Güssing and in the RENET, a competence network financed by the K-net program; additionally pressurized biomass gasification (which is needed for the Fischer-Tropsch process) is investigated in the Austrian Bioenergy Centre. R&D is mainly funded by the Ministry for Traffic, Industry and Technology in the frame of the K-plus program, in the "Austrian Technology for Sustainable Development" program as well as in the A3 program of the same Ministry. The so-called "Tri-Generation" of power, heat and synthetic natural gas is near to the demonstration stage; a first 40 MW plant is planned.

1.4 Market development and policy effectiveness

Table 1.3 - Biofuel development and market share, Austria

Production (Year)	Biodiesel (tonnes)	Bioethanol (tonnes)	PPO (n/a)	Biogas (n/a)	2 nd -Gen (n/a)	Market share (%)
2000						
2001						
2002						
2003	55,000 ^(A)					0.45%
2004	55,000 ^(A)					0.6%
2005	70,000 ^(B)					1.1% ^(C)
2006	200,000					
2007		160,000				
2008						
2009						
2010						

Source: Austrian Energy Agency. *Grey italicized figures are predicted values.*

(A) Production value; actual consumption was estimated to be 5,500 tonnes, with the balance exported

(B) Production value; actual consumption was 93,000 tonnes

(C) (v/v basis). Substituted energy content for the last quarter of 2005 was 3.2%

All in all 10 biodiesel plants with a production capacity of about 187,000 tonnes are in operation in 2006. Two more large plants are under construction at the moment. One of them will be situated in Pischelsdorf with a production capacity of 200,000 m³ ethanol per year. It will start its production by 2007. Together with an expected increase of capacity in Vienna, Wöllersdorf and Mureck the production capacity is anticipated to reach 488,000 tonnes in 2007. The estimated amount of biodiesel required for 2006 is around 223,000 tonnes.

With regard to biogas, an estimated amount of 69 to 104 million m³ of biogas was produced in about 200 agricultural installations in Austria. Also 62 waste and 134 sludge treatment plants have produced about 170 million m³ of biogas. Although by now almost the whole amount is currently converted into electricity, some farmers are also very interested in using biogas as a transport fuel.

1.5 Sources

- ▶ Bundesgesetzblatt für die Republik Österreich, 4. November 2004, 417. und 517. Verordnung, Änderungen der Kraftstoffverordnung 1999, *Austrian Fuels Ordinance 1999*, amended 4 November 2004 (BGBl. II, Nr 417/2004) and 30 December 1999 (BGBl. II, Nr 517/2004)
- ▶ BMWA, Federal Ministry of Economics and Labour, “Renewable Energy in Austria”, 2003
- ▶ BMWA, Federal Ministry of Economics and Labour, “Energiebericht 2003”, Austrian Energy Report of 2003
- ▶ Federal Environment Agency, “Biofuels in the transport sector in Austria: 2005”, Stefan Salchenegger, summary of information from the Republic of Austria in accordance with Article 4(1) of Directive 2003/30/EC for the reporting year 2004
- ▶ EU-Project VIEWLS, *Clear View on Clean Fuels*, WP3: “Markets and Policies in Western and Eastern European Countries”, ADEME, France, BLT Wieselburg, Austria, January 2005
- ▶ Website: <http://www.umweltbundesamt.at/en/umweltschutz/verkehr/kraftstoffe/>, Umweltbundesamt
- ▶ Website: <http://www.ebb-eu.org/legislation.php>, European Biodiesel Board
- ▶ Website: www.biomasseeverband.at/, Austrian Biomass Association
- ▶ Website: www.statistik.at/jahrbuch2006/energie, Statistics Austria
- ▶ Website: www.agrana.at/, Agrana Sugar-Starch-Fruit Group Companies
- ▶ Website: www.landwirtschaftskammer.at/, Austrian Chamber of Agriculture
- ▶ Website Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, www.lebensministerium.at

2 Belgium

2.1 Introduction

Belgium has a very low domestic availability of energy sources. This is why since the early 1970s, Belgium's overall policy objectives have concentrated on security of supply based on diversification of geographical sources and fuels (especially for electricity production), energy efficiency, transparent and competitive energy pricing and environmental protection.

Since the 1990s the three regions (Flanders, Wallonia, Brussels-Capital) are responsible for a large share of the energy policy. Nuclear energy remains a federal competence, and in 2003, Belgium decided to phase out nuclear power between 2015 and 2025. This will be a significant challenge as nuclear energy supplies about 55% of the country's electricity.

The three regions have their own energy policy goals, which create some fragmentation of energy policy within the country. Electricity and gas markets are regulated. The regions are generally promoting the efficient use of energy, both in the residential sector as in industry and the service sector. Also the use of renewable energy and CHP is promoted. The overall goal is to have 6% of the electricity production from renewables by 2010 (responsibility of the regions to reach this).

Fuel consumption in road transport in Belgium amounts 350 PJ in 2004 (265 PJ diesel and 85 PJ petrol). Diesel consumption is expected to increase, while petrol consumption is expected to decline by 2010. Total road fuel consumption in Belgium is expected to rise to more than 400 PJ in 2010.

2.2 Main drivers for biofuels policy

There are various drivers for biofuel policies in Belgium, also depending on the policy level. Mainly the regional policy level is supportive for the introduction of biofuels, however the main actions to bring biofuels on the market (tax reductions and quota) are federal competence. This diversion (regional interest versus federal competence) is one of the reasons for the delay in the introduction of biofuels in Belgium.

The main driver for biofuel policies is to decrease the CO₂ emissions from transport to reach the Kyoto targets. While all sectors showed a decrease in CO₂ emissions in the past years, the transport sector was the only one with ever increasing CO₂ emissions. The second driver is support to the agricultural sector and the agro-industry and to create chances for these sectors in the future. Security of supply has been mentioned as a driver (mostly on federal level, also related with the recent increase of crude oil prices) but seems to be of less importance.

2.3 Biofuels policy

Biofuel targets

The table below shows the biofuel targets the federal government in Belgium is aiming to achieve. The government relies on a quota system to realize these targets (for more information, see Excise duty reductions'). In this the government expects that 9 vol-% ethanol blending will be generally approved from the beginning of 2008. It is expected that the use of pure plant oil will remain marginal (< 1.0 PJ/year).

In October 2006, the production quota eligible for tax exemption were assigned. The next six years, three companies (BioWanze, Alco Bio Fuel and Tate & Lyle) will be allowed to produce 250 million litres of bioethanol in total. The bioethanol will be produced from sugar beet, wheat and maize. The first quota for biodiesel of 286 million litres was divided among four biodiesel producers (Proviron, Flanders Bio Fuel, Oléon and Néochim) for a duration of 11 months (November 1, 2006 until September 30, 2007). The quota for the second phase (October 2007 until 2012) of 2.27 billion litres is still to be divided.

Table 2.1 - Quota, expressed in energy [PJ]

Quota	Biodiesel (PJ)	Bioethanol (PJ)	Total biofuels	Target published by the federal government
Year				
2005				2.0%
2006	1.7		1.7	2.75 %
2007	12.5	1.0	13.5	3.5 %
2008	12.5	5.3	17.8	4.25 %
2009	12.5	5.3	17.8	5.0 %
2010	12.5	5.3	17.8	5.75%

Excise duty reductions

Until 2005 biofuels could be exempted from excise duties in pilot demonstration projects. Apart from that, biofuels had the same tax as their mineral counterparts.

In February 2004 the Belgian Government announced a defiscalisation of biofuels, to achieve the European targets. In March 2005 the Belgian federal government accepted in a Royal Decree the implementation of the European Directive 2003/30/EC, hereby also accepting the target of 2% biofuels by the end of 2005, with a linear increase (yearly 0.75%) up to 5.75% in 2010. At that time no concrete incentives were announced.

In July 2005 the Belgian Parliament approved a new programme law ("programmawet"), which included a tax reduction for blended biofuels (biodiesel and bioethanol) and a full tax exemption for pure plant oil. This proposal was sent to the European Commission for approval. After some additional questions and some adjustments, the European Commission approved the proposed measures in December 2005. In June 2006 the 'Law on Biofuels' was signed and a tender for biofuel producers was launched. From November 2006 until September 2013 tax exemption will be given to low sulphur diesel fuels blended with a minimum level of biodiesel, and from October 2007 until September 2013 for low sulphur petrol fuels blended with a minimum level of bioethanol (or ETBE). The tax reduction will only be applied for a specific quota, which is assigned via tenders.

Rapeseed oil is exempt from fuel tax from 3 April 2006 (Royal Decree of 10 March 2006, valid for 6 years), under the condition that it is sold directly from the producer of the oil (based on his own production of rapeseed) to the end user. Exception are the public transport companies (De Lijn, MIVB, TEC), who can buy their plant oil free from tax from industrial producers.

The legal text of the tax reduction mentions the specific GN codes for biodiesel/FAME (GN-code 3824 90 99), ethanol (GN-code 2207 10 00), ETBE (GN-code 2909 19 00) and rapeseed oil (GN-code 1514).

The federal government always indicated that the introduction of biofuels should be a budget neutral operation for them, so tax reduction for biofuel blends is compensated by a tax increase on fossil fuels.

Tax reductions for biofuels may be subject to revisions to prevent overcompensation.

Table 2.2 - Tax reduction in €/litre biofuel

Year	Ethanol / ETBE		Biodiesel (FAME)			Rapeseed Oil
	E7 *	E9 *	B3.37 **	B4.29 **	B5 **	Pure
2005						
2006			0.352 ^(B.1)			0.341 ^(C)
2007	0.623 ^(A.1)			0.352 ^(B.2)	0.352 ^(B.3)	0.341 ^(C)
2008		0.623 ^(A.2)			0.352 ^(B.3)	0.341 ^(C)
2009		0.623 ^(A.2)			0.352 ^(B.3)	0.341 ^(C)
2010		0.623 ^(A.2)			0.352 ^(B.3)	0.341 ^(C)
2011		0.623 ^(A.2)			0.352 ^(B.3)	0.341 ^(C)
2012		0.623 ^(A.2)			0.352 ^(B.3)	0.341 ^(C)

^(A.1) From October 2007 – December 2007: Tax reduction of € 0.0436 per litre for low sulphur gasoline containing minimum 7 vol-% ethanol (can be in the form of ETBE, where the ethanol fraction is calculated as 47 vol-% of the ETBE). No tax reduction for lower percentages. Valid for an ethanol volume (quota) of 48,000 m³.

^(A.2) From January 2008 – September 2013: Tax reduction of € 0.0436 per litre for low sulphur gasoline containing minimum 9 vol-% ethanol (can be in the form of ETBE, where the ethanol fraction is calculated as 47 vol-% of the ETBE). No tax reduction for lower percentages. Valid for an ethanol volume (quota) of 250.000 m³ per year.

* Reduction for higher ethanol blends only possible for public transport companies (De Lijn, MIVB, TEC). Tax reduction is however limited to the special excise tax (0.35€/litre for petrol fuel).

^(B.1) From November 2006 – December 2006: Tax reduction of € 0.0119 per litre for low sulphur diesel containing minimum 3,37 vol-% FAME. No tax reduction for lower percentages. Valid for a biodiesel volume (quota) of 52.000 m³.

^(B.2) From January 2007 – September 2007: Tax reduction of € 0.015 per litre for low sulphur diesel containing minimum 4.29%vol FAME. No tax reduction for lower percentages. Valid for a biodiesel volume (quota) of 234.000 m³.

^(B.3) From October 2007 – September 2013: Tax reduction of € 0.0176 per litre for low sulphur diesel containing minimum 5 vol-% FAME. No tax reduction for lower percentages. Valid for a biodiesel volume (quota) of 380.000 m³ per year.

** Tax reduction for higher biodiesel blends only possible for public transport companies (De Lijn, MIVB, TEC). Tax reduction is however limited to the special excise tax (0.14€/litre for diesel fuel).

^(C) Only valid under the condition that the rapeseed oil is sold directly from the producer of the oil (based on his own production of rapeseed) to the end user. Exception are the public transport companies (De Lijn, MIVB, TEC), who can buy their plant oil free from tax from industrial producers.

Biofuel obligations

At the moment no obligation system is prepared.

Fiscal incentives

Not available

Investment subsidies

Not available

Other measures stimulating the implementation of biofuels

Promotion of biofuels in adapted vehicles:

The regional governments are promoting the use of pure rapeseed oil, by information dissemination to the agricultural sector. Financial support is also given for oil pressing installations, vehicle conversions and demonstration projects.

Promotion of second generation biofuels

So far, actions concerning second generation biofuels are focused on research scale. No measures are foreseen yet to promote the introduction of second generation biofuels.

2.4 Market development and policy effectiveness

Following the announcements of the biofuel tax reduction and quota, a number of industrial players have announced to be interested to produce biodiesel of bio-ethanol. When counted

together the announced production capacities are much higher than the quota, which were assigned in October 2006.

As mentioned before the responsibility for tax reduction lies on federal level (finance administration), while energy and agricultural policy are regional competences. Sometimes this creates conflicts between the different policy levels, causing delays and policy inefficiencies.

Table 2.3 - Biofuel development and market share, Belgium

Production (Year)	Biodiesel (m³)	Bioethanol (m³)	PPO (n/a)	Biogas (n/a)	2nd-Gen (n/a)	Market share (%)
2000						
2001						
2002						
2003						
2004						
2005						
2006						
2007	286,000 ^(A)	48,000 ^(D)				
2008	475,000 ^(B)	250,000 ^(E)				
2009	380,000 ^(C)	250,000 ^(E)				
2010	380,000 ^(C)	250,000 ^(E)				

Source: Federal Public Service of Finance. *Grey italicized figures are predicted values.*

(A) Call for tenders active from 1 November 2006 until 30 September 2007

(B) Call for tenders active from 1 October 2007 until 31 December 2008

(C) Call for tenders active from 1 January 2009 until 31 December 2012; will be reduced to 284,000 m³ from 1 January 2013 until 30 September 2013

(D) Call for tenders active from 1 October 2007 until 31 December 2007

(E) Call for tenders active from 1 January 2008 until 31 December 2012; will be reduced to 187,500 m³ from 1 January 2013 until 30 September 2013

2.5 Sources

- ▶ http://mineco.fgov.be/energy/biofuels/biofuels_nl.htm
- ▶ Communication C(2005)5960 of the European Commission towards the Belgian Government "Betreft: Steunmaatregel nr. N 334/2005 – België, Verlaging van het accijnstarief voor biobrandstoffen", 23 December 2005.
- ▶ 10 juni 2006 – wet betreffende de biobrandstoffen, Belgisch Staatsblad (16-06-2006), C – 2006/03297: http://mineco.fgov.be/energy/biofuels/pdf/law_biofuels.pdf
- ▶ 10 MAART 2006. - Koninklijk besluit betreffende koolzaadolie gebruikt als motorbrandstof.
- ▶ Anon (2006) Progress report on the promotion of biofuels in Belgium in 2006. Federal Public Service of Finance, Brussels, Belgium

3 Brazil

3.1 Introduction

The oldest example of widespread biofuel development is found in Brazil, which produces ethanol from sugar- or starch-based material in the form of sugar cane and sugar cane residues. In response to the first oil crisis of the 1970's, Brazil invested heavily in fuel alcohol primarily as a means of increasing fuel security and saving foreign currency on petroleum purchases.

3.2 Main drivers for biofuels policy

The original policy choice was to create direct funding sources to create biofuel capacity. In 1975, a diversification program for the sugar industry called Proálcool was created with large public and private investments supported by the World Bank, allowing expansion of the sugarcane plantation area and construction of alcohol distilleries, either autonomous or attached to existing sugar plants.

The second group of policies introduced in Brazil provided a subsidy for bioethanol use. Two related financing schemes were organized to guarantee fuel sale price; the FUPA program guaranteed US\$ 0.12 L⁻¹ ethanol for E22 (a blend of 22 % ethanol in gasoline), while the FUP program provided US\$ 0.15 L⁻¹ for E100 (or pure, anhydrous ethanol) fuel. By 1996/97, the total subsidy delivered via these programs reached about US\$ 2 billion per annum.

3.3 Biofuels policy

Biofuel targets

Brazil has introduced mandatory blending targets for both bioethanol and biodiesel (for more information, see 'Biofuel obligations').

Excise duty reductions

Not applicable.

Biofuel obligations

Brazil's domestic market still utilizes the single largest portion of fuel ethanol capacity in the country. The presence of a Renewable Fuel Standard means that all Brazilian gasoline has a legal alcohol content requirement that has ranged between 20% and 25%. As of November 2006, the RFS stands at 23%. Brazil has also introduced a mandatory blending target for biodiesel: 2% as of 2008.

Table 3.1 - Biofuel targets (% by energy)

Target year	Petrol	Diesel	Petrol + Diesel
2002			
2003			
2004			
2005	20-25%		
2006			
2007			
2008			

Fiscal incentives

Not available.

Investment subsidies

Not available.

Other measures stimulating the implementation of biofuels

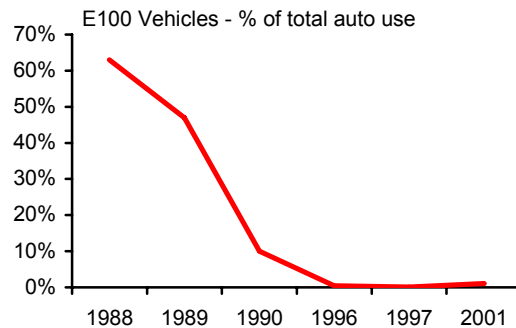
Not available.

Promotion of second generation biofuels

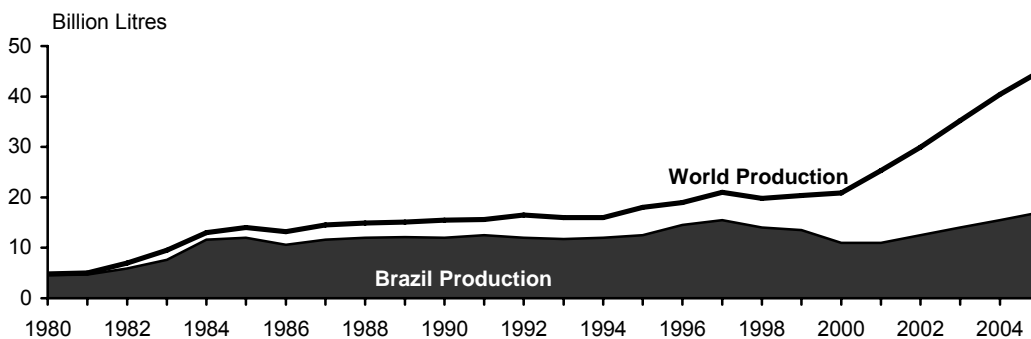
Not available.

3.4 Market development and policy effectiveness

The presence of a renewable fuel standard and of strong subsidies to E100 production, combined with the second oil shock of the early 1980's, resulted in the successful adaptation of engines to E100 fuel use. By 1984, E100 vehicles accounted for 94.4% of domestic automobile manufacturers' production, and in 1988 participation in the E100 program reached 63% of total vehicle use in the country. The upward trend ended, however, when high global sugar prices led to a crash in availability of fuel alcohol, resulting in a consumer shift away from E100 vehicles as illustrated in the graph below. Most vehicles today are being run on E20 or E22, but sales of flex-fuel vehicles (FFV) capable of operating on E85 blends are strong. Brazil has developed a unique distribution infrastructure for this fuel, with a network of more than 25 thousand gas stations with E20 pumps.



Brazil is the world's largest exporter of fuel-grade bioethanol, with approximately 3 billion litres (from total production of about 18 billion litres) expected to be offered for export in the 2006/07 harvest. Today, the primary destinations for ethanol exports are the USA, Europe, and Korea and Japan, which together accounted for estimated total exports of 3.1 billion in 2006. Many countries that lack significant biomass resources, such as Japan, have made Brazilian ethanol a part of their renewable fuel strategies.



Domestic use of bioethanol remains strong. Rising demand for bioethanol - in part caused by policies in other countries - has created an impetus for new product capacity. Recently, it was reported that UNICA plans to open 77 new ethanol plants by 2013, adding to the existing 248 plants. When complete, this will raise the country's production capacity to about 35.7 billion litres.

Table 3.2 - Biofuel development and market share, Brazil

Production (Year)	Biodiesel (000 L/a)	Bioethanol (000 L/a)	PPO (n/a)	Biogas (n/a)	2 nd -Gen (n/a)	Market share (%)
2000		11,000				
2001		11,000				
2002		12,500				
2003		13,690				
2004		15,638				
2005	12,112	16,216				
2006		17,273				
<i>2007</i>		<i>18,891</i>				
<i>2008</i>		<i>20,869</i>				
<i>2009</i>		<i>23,034</i>				
<i>2010</i>		<i>25,384</i>				

Source: F.O. Lichts. *Grey italicized figures are predicted values.*

3.5 Sources

- ▶ AFTA (2000) Brazilian alcohol: A review of production, subsidies and incentives. Association for Fair Trade in Alcohol, Brussels, Belgium
- ▶ MAPA Camara Setorial Acucar e Alcool
- ▶ Korbitz et al 2003 World-wide review on biodiesel production
- ▶ Nastari, P.M. 2003. Brazil's strategy of globalization for fuel ethanol. In Proceedings of the 8th Annual Renewable Fuels Association National Ethanol Conference. Scottsdale, Arizona, February 17-19 2003.
- ▶ UNICA 2003. Evolution of Total Ethanol Production. Available online at http://www.unica.com.br/i_pages/estatisticas.asp#.
- ▶ Moreira JR, Goldemberg J (1999) Energy Policy 27:229
- ▶ Viera de Carvalho, A.. 2003. The Brazilian ethanol experience as fuel for transportation. Presented at Energy Week 2003 Biomass Energy Workshop & Exhibition. The World Bank, February 26, 2003.
- ▶ F.O. Lichts (2007) World Ethanol & Biofuels Report 5(9):195
- ▶ F.O. Lichts (2006) World Ethanol & Biofuels Report 5(2):40,48

4 Canada

4.1 Introduction

A country poised to be a major biofuel producer is Canada, which currently produces about 250 million litres annually. Recently, the federal government announced the proposed Clean Air Act, which was tabled on October 19 2006. Unfortunately, the proposed Act does nothing to codify the government's biofuels target, and does not provide concrete policy incentives for additional biofuel use.

4.2 Main drivers for biofuels policy

Under Liberal federal governments (1993-2005), the primary driver for the development of biofuels in Canada was linked to the federal government's environment strategy. Funding programs were derived from environment-related monies and included tax exemptions and project funding to expand domestic biofuel capacity, as well as innovation funds for research and development. This strategy has evolved with the ascension of a Conservative minority federal government in 2005. Tax exemptions remain in place, but no new project funding has been announced. The primary driver being discussed by policymakers today seems to be rural diversification.

4.3 Biofuels policy

Biofuel targets

The Conservative minority federal government made a campaign promise to introduce a 5% biofuels mandate across Canada (as did the outgoing Liberal government). An agreement with provincial governments on the 5% mandate was reached in May, 2006 which will see this mandate take full effect by 2010 (for more information, see 'Biofuel obligations').

Excise duty reductions

In Canada, exemptions from both federal and provincial fuel excise taxes have been provided for ethanol blends. These taxes essentially act as a rebate for producers. The federal excise tax applies across the country; provincial excise tax exemptions for E10 blends are available in five jurisdictions and may be considered as additional incentives. Note that some provincial exemptions - in Quebec, Saskatchewan, and Manitoba - apply only to ethanol that is produced within that particular jurisdiction.

*Table 4.1 - Tax exemptions by province
(Total fuel excise tax rate, Exemption for E10 fuel blends) (¢/litre)*

Province/Territory	Federal		Provincial		Total	
	Tax rate	Exemption	Tax rate	Exemption	Tax rate	Exemption
Alberta	10.0	1.0	9.0	0.9	19.0	1.9
British Columbia	10.0	1.0	14.5	0.0	24.5	1.0
Manitoba	10.0	1.0	11.5	2.5	21.5	3.5
New Brunswick	10.0	1.0	14.5	0.0	24.5	1.0
Newfoundland	10.0	1.0	16.5	0.0	26.5	1.0
Northwest Territories	10.0	1.0	10.7	0.0	20.7	1.0
Nova Scotia	10.0	1.0	15.5	0.0	25.5	1.0
Nunavut Territory	10.0	1.0	6.4	0.0	16.4	1.0
Ontario	10.0	1.0	14.7	1.47	24.7	2.47
Prince Edward Island	10.0	1.0	14.0	0.0	24.0	1.0
Quebec	10.0	1.0	15.2	2.0	25.2	3.0
Saskatchewan	10.0	1.0	15.0	1.5	25.0	2.5
Yukon Territory	10.0	1.0	6.2	0.0	16.2	1.0

British Columbia offers a full rebate (14.5 ¢/litre) on E85 blends

Biofuel obligations

In May, 2006 the conservative minority federal government reached an agreement with provincial governments on a 5% biofuels mandate. This mandate will take full effect by 2010. However, there is some dispute as to how this will be implemented and it has been suggested that high-population centers may in fact require higher renewable blends to counteract lack of renewable fuel availability in some rural areas of the country.

Ontario has had a Renewable Fuels Standard since 2004, when it announced that a 5% blend of biofuels must be achieved by 2007, and 10% by 2010. In order to fund this, Ontario created a \$520 million 'Ontario Ethanol Growth Fund' (OEGF) which will contribute to developing a healthy ethanol industry and encourage the development of ethanol plants in Ontario. Manitoba does not have a renewable fuel standard in place, but has a stated goal of 10% ethanol-blends sold in all retail centers in the province as soon as the supply of blended fuel makes this possible. Quebec has mandated a 5% ethanol mandate for 2012, and has put its focus on cellulosic ethanol. Saskatchewan has a legislated mandate requiring an average of 7.5 percent ethanol or biodiesel-blend in fuel sales as of mid-2006.

Fiscal incentives

Not available.

Investment subsidies

Previous governments have provided more substantial support to biofuels, including a cumulative investment of \$2.7 billion CDN into the implementation of the former Climate Change Plan for Canada, which included incentives for the development and use of environmentally-friendly technologies including bioethanol. The federal Canadian government provided direct funding for the industry through the Ethanol Expansion Program (announced 2003), which in 2004 and 2005 provided a total of \$118 million in direct funding for eleven projects, six of which are currently in active development.

Other measures stimulating the implementation of biofuels

An additional \$40 million was allocated for contingent loan guarantees, and \$3 million was budgeted for a public awareness campaign. Most recently, the Alberta government has announced a commitment of \$239 million to expand the province's bioenergy sector by encouraging products including biofuels development.

Promotion of second generation biofuels

Not available.

4.4 Market development and policy effectiveness

Table 4.2 - Canadian biofuel development by province

Province	Operating Capacity (M L)	Planned Capacity (M L)	Start Date	Feedstock
Quebec	17		1990	Lignocellulose
Quebec		126	2007	Starch (corn)
Ontario	0.11		2004	Lignocellulose
Ontario	22		1989	Starch (corn)
Ontario	150		1998	Starch (corn)
Ontario		199	2008	Starch (corn)
Ontario		66	2007	Starch (corn)
Ontario		208	2007	Starch (corn)
Ontario		119	2008	Starch (corn)
Ontario		52	2008	Starch (corn)
Manitoba	10		1981	Starch (wheat)
Manitoba		130	2007	Starch (wheat)
Saskatchewan		130	2006	Starch (wheat)
Saskatchewan		25	2006	Starch (wheat)
Saskatchewan	12		1990	Starch (wheat)
Alberta	28		1998	Starch (wheat)
Alberta		12	2006	Starch (wheat)
British Columbia		114	2007	Starch (wheat)
TOTAL	239.11	1,181		

Table 4.3 - Biofuel development and market share, Canada

Production (Year)	Biodiesel (000 L/a)	Bioethanol (000 L/a)	PPO (n/a)	Biogas (n/a)	2 nd -Gen (000 L/a)	Market share (%)
2000		222,000			17,000	
2001		222,000			17,000	
2002		222,000			17,000	
2003		222,000			17,000	
2004		222,000			17,110	
2005	90,000	222,000			17,110	
2006		389,000			17,110	
2007		1,033,000			17,110	
2008		1,164,000			17,110	
2009		1,164,000			17,110	
2010		1,164,000			17,110	

Source: Canadian Renewable Fuels Ass'n. Grey italicized figures are predicted values.

4.5 Sources

- ▶ Department of Finance Canada. 2006. Catalogue of Federal, Provincial and Territorial Taxes on Energy Consumption and Transportation in Canada: 1. Available online at http://www.fin.gc.ca/susdev/sdscat_1e.html
- ▶ Canadian Renewable Fuels Assn (2006) <http://www.greenfuels.org/biodiesel/production.htm>
- ▶ NRCan (2005) Ethanol Expansion Program. Natural Resources Canada, Ottawa, Canada
- ▶ NRCan. 2006. Office of Energy Efficiency. Available online at http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/programs.cfm?attr=0
- ▶ Johnstone B (2006) Ottawa's 5% biofuel program backed. Regina Leader-Post, May 24, 2006
- ▶ USDA Foreign Agricultural Service. 2006. GAIN Report. Available online at <http://www.fas.usda.gov/gainfiles/200609/146208865.doc>

5 China

5.1 Introduction

China has grown its bioethanol production sector rapidly since 2000 to become the third-largest single bioethanol producer after the United States.

5.2 Main drivers for biofuels policy

China's stated objectives for biofuel development are (1) improving rural economies and the welfare of rural inhabitants; (2) energy security, specifically reducing dependence on foreign oil; (3) the mitigation of emissions noxious to the environment. Over the past two decades, China's vehicle market has been the fastest growing in the world. In addition, more and more people in China are purchasing privately owned vehicles requiring fuel. According to data from the national Bureau of Statistics of China, the number of automobiles owned nationwide reached 26.94 million in 2004 (passenger cars: 17.36 million; trucks: 8.93 million; others: 0.65 million). The average growth rate between 1986 and 2004 was 11.8 percent. In Beijing alone, authorities report 1,000 new cars are added each day to the city's roads.

5.3 Biofuels policy

Biofuels legislation was first passed in April 2001, when China released laws on the use of denatured fuel ethanol (GB18350-2001) and bioethanol-gasoline blends for automobiles (GB18351-2001). These laws established standards for the production of E10. A year later on March 22, 2002, the government launched a model to introduce E10 into specified areas of China. The second phase of biofuel development established a legal system for biofuel (and for the relevant raw materials required) production, transportation and sales. The Bioethanol Utilization Plan was included in the 11th Five-Year Plan (2001-2005).

Biofuel targets

The government of China has stated that the biofuel sector will meet 15 percent of China's transportation energy needs by 2020. This is only a target and not a legislated mandate at this time, although the nature of the Chinese system makes this point somewhat less important.

Excise duty reductions

Not applicable.

Biofuel obligations

Some Chinese provinces have announced biofuel mandates, although the national government has not yet made any decision about legislating biofuel use.

Fiscal incentives

Not available.

Investment subsidies

Not available.

Other measures stimulating the implementation of biofuels

Not available.

Promotion of second generation biofuels

Not available.

5.4 Market development and policy effectiveness

Although diesel fuels are the most widely used fuels in China today, the lack of a standard for biodiesel use has restricted uptake of biodiesel products. Thus, most development has focused on bioethanol. Total bioethanol capacity from four plants in 2005 was about 1.3 billion litres, but continued high prices for international oil has led the National Development and Reform Commission (NDRC) to announce dramatic increases, designed to replace about 2 million tonnes of crude oil by 2010, and 10 million tonnes by 2020. The Commission also announced that China would begin shifting to non-grain feedstocks, including sweet sorghum, for bioethanol production. Jilin Fuel Alcohol remains the world's largest corn-based bioethanol plant with a current capacity

in excess of 350 million litres per year. The biofuel industry in China has been subsidized to an unknown extent, mostly in terms of funds to construct biofuel plants.

There is some concern that, if ethanol production remains as profitable as it is at present, the cultivation of crops for ethanol could displace food crops, reducing food production. The NDRC asserts that developing 6 million MT of biofuel ethanol production within the context of the 11th Five-Year Plan will not threaten China's grain security. It will affect its production mix and increase imports of inputs.

Table 5.1 - Biofuel development and market share, China

Production (Year)	Biodiesel (000 L/a)	Bioethanol (000 L/a)	PPO (n/a)	Biogas (n/a)	2nd-Gen (n/a)	Market share (%)
2000						
2001						
2002						
2003						
2004						
2005	58,800	1,300,000				
2006						
2007						
2008						
2009						
2010						

Source: GTZ (2006). *Grey italicized figures are predicted values.*

5.5 Sources

- ▶ Latner, K., O'Kray, C. and Jiang, J. (2006). Strict government control characterizes Chinese biofuel development.
- ▶ USDA Foreign Agricultural Service. 2006. GAIN Report. Available online at <http://www.fas.usda.gov/gainfiles/200608/146208611.pdf>
- ▶ GTZ (2006). <http://www.gtz.de/de/dokumente/en-foerster-gtz-2006.pdf>

6 Denmark

6.1 Introduction

Denmark has a multi-faceted energy supply based on a variety of energy sources, a high degree of efficiency in energy consumption and a significant auto-production of oil, natural gas and renewable energy. According to the Government's national *Energy Strategy 2025* from June 2005 the goal is to improve the use of market mechanisms and to promote more cost-effective initiatives. The Danish electricity and natural gas markets have been completely liberalized. With the implementation of the CO₂ allowance system in the European Union, a step has been taken towards flexibility in climate protection. It reduces energy costs and increases freedom of choice. Finally, developments in the energy system are to a large extent to be based on Danish knowledge and technology.

Renewable energy is increasingly used to produce electricity and heat. 25% of the electricity supply alone is based on renewable energy sources and 15% of the total energy consumption in all sectors is covered by renewable energy sources – mainly biomass like straw and wood. It is the Government's intention to use the market as a basis for continued increased use of renewable energy. An increased use of renewable energy in step with market needs for new capacity will be far more cost-effective than politically forced increased use of renewable energy by the use of for example quantitative targets.

6.2 Main drivers for biofuels policy

The main driver for biofuel policies in Denmark is to contribute to the European security of supply and decrease in the CO₂ emissions from transport. Furthermore, the potential for national economical growth due to a fast growing international market for especially bioethanol is a driver. The Danish enzyme industry are global market leaders within enzymes to the production of biofuels and the farmers are looking for alternative markets for their products under the impression of the increased international competition with regards to agricultural products.

6.3 Biofuels policy

Biofuel targets

Denmark consider the use of biomass for combined heat and power production, that is widely implemented in the Danish energy supply, to be a considerably more cost-effective use of the biomass resources with the present technology (first generation) for the production of biofuels. The policy target is to meet the European Biofuels Directive. Thus, Denmark has set a national target of 0.1 % for the use of biofuels compared to fossil fuels by the end of 2006.

Excise duty reductions

Tax exemptions for biofuels in Denmark are of recent date. Since 1 January 2005, there is given a general minor tax-reduction according exactly to the normal CO₂-tax on fossil fuels of 0.22 – 0.24 DKK per litre. The CO₂ advantage for the society is considered to be the only one that can be quantified.

Table 6.1 - Tax reduction in €/litre biofuel

2005 and onwards (short term prognosis)	0.03 €* per litre biofuel (reduced accordingly when blended with fossil fuel)**
--	--

* Currency conversion factor: 1 € = 7.50 DKK

** In practice only a 5% bioethanol blend is used in Denmark. The use of other biofuels for transport is marginal.

Biofuel obligations

There is no biofuel obligation in Denmark.

Fiscal incentives

Not available.

Investment subsidies

Not available.

*Other measures stimulating the implementation of biofuels*Biodiesel demonstration programme:

The Government has launched a limited biodiesel programme for 2006-2008 of 60 million DKK. The programme's aim is to demonstrate the use in practice of biodiesel in selected and limited fleets of vehicles – for instance public busses. The main part of the programme budget is expected to be used to compensate the project hosts for the higher prices on biodiesel compared to mineral diesel during the project period. The implementation of the programme is for the time being under consideration.

Promotion of second generation biofuels

The Government has launched a new national Danish programme for the development of cost-effective second-generation technology for the production of bioethanol of 200 million DKK for 2007-2010 with focus on large-scale demonstration. The programme support will be in the form of R&D grants to pre-commercial investments in and operation of pilot- and demo-plants. The implementation of the programme is for the time being under consideration.

6.4 Market development and policy effectiveness

Up to 2006 the use of biofuel in Denmark was marginal. In May 2006, the first and so far only oil company Statoil introduced a 5% bioethanol blend – Bio95 – on a voluntary basis on the Danish market to a neutral price per litre for the consumer. Other companies may follow in the near future leading to a more than marginal domestic use of biofuels.

Denmark has one RME-factory producing approximately 100,000 tons per year biodiesel mainly for the profitable German market. One planned initiative (possible factory) exists for the production of approximately 60,000 tons per year biodiesel based on animal fat from slaughterhouses. A range of private and farmer initiatives (possible factories) exists for large-scale production of bio-ethanol based on wheat and sugar beet. Decisions to build some of these plants are awaiting the market response to the Statoil initiative and the investors' judgment of other relevant market conditions.

Table 6.2 - Biofuel development and market share, Denmark

Production (Year)	Biodiesel (000 L/a)	Bioethanol (n/a)	PPO (n/a)	Biogas (n/a)	2nd-Gen (n/a)	Market share (%)
2000						
2001						
2002	11,760					
2003	47,040					
2004	82,320					
2005	83,496					
2006						
2007						
2008						
2009						
2010						

Source: EBB (2006), *Grey italicized figures are predicted values.*

6.5 Sources

- ▶ *Energy Strategy 2025* – Danish Ministry of Transport & Energy, June 2005
- ▶ Law no. 1391 of 20 Dec. 2004 on adjudgements of CO₂-taxes for certain energy products etc., § 7.4 regarding biofuels (“Lov om ændring af CO₂-afgift for visse energiprodukter mv.”).
- ▶ www.ens.dk (Danish Energy Authority – Ministry of Transport & Energy)
- ▶ European Biodiesel Board. 2006. Statistics - The EU Biodiesel Industry. Available online at <http://www.ebb-eu.org/stats.php>

7 Finland

7.1 Introduction

Bioenergy is the most important renewable energy source in Finland, with abundant domestic raw material available. Bioenergy consumption in Finland in 2003 was approximately 287 PJ. The most important bioenergy sources are effluents produced in the forest industry, industrial wood residues such as sawdust and bark as well as forest chips and recycled fuels. Bioenergy is used for heat and power production for industry and municipalities in general. Its use has increased by over 70% since the early 1990s. Bioenergy currently covers 23% of total energy supply, one of the highest figures among the industrialized nations, and 11% of total electricity consumption. There are currently around 400 plants using solid biofuels in Finland ranging in size from less than 1 MW to nearly 600 MW.

There are several national programmes related to promoting bioenergy: Action plan for renewable energy sources (Ministry of Trade and Industry, 1999, revised 2002), Finland's National Forest Plan 2010 (Ministry of Agriculture and Forestry, 1999) and National Climate Strategy (Ministry of Trade and Industry, 2001). In 2005, the National Strategy was revised taking into account the enforcement of the Kyoto Protocol and emission trading system. The potential to increase the utilization of bioenergy in Finland is still great, and a share of 30% of primary energy consumption is indicated in the Action Plan for renewable energy sources as the target value for biomass use in 2025. Wood is the major biofuel for large-scale energy production.

The proportion of biofuels for transportation in overall sales of transport fuels in 2003 and 2004 was around 0.1%. The official figures for 2005 are not yet available, but the use of biofuels was less than in 2003 and 2004. In 2004 the consumption of transport biofuels was based on two experimental projects, in which 5% ethanol was mixed with petrol (v/v basis). In Finland there is also small-scale production and use of biodiesel and biogas on an experimental basis as transport fuel, but the actual use of these biofuels is extremely restricted (a few cars only).

7.2 Main drivers for biofuels policy

The main drivers for biofuel policies in Finland are the reduction of the dependence of fossil fuel imports and reduction of greenhouse gas emissions.

7.3 Biofuels policy

Biofuel targets

Given the low starting point of the use of biofuels for transport, the limited possibilities of producing biofuels from biomass and the drive to increase the use of bioenergy for heat and power production, Finland's national indicative target for the minimum proportion of biofuels was set in the directive report of 2004 at 0.1 % in 2005. Nevertheless, it was realized that the importance of biofuels for transport may increase in the long term, e.g. technological advances may make it possible to use new raw materials such as wood or waste-based raw materials for the use of biofuels and thereby to reduce production costs.

Ministry of Trade and Industry set up a task force to assess the promotion of biofuel use and production in transport sector in the end of 2005. The task force suggested that an obligation law should form the primary tool to promote the use of biofuels. The task force recommended that the share of biofuel should annually increase in such way that it would account for 1% (energy basis) of all transport fuels in 2008, 2% in 2009 and 3% in 2010. It further states that theoretically it is possible to achieve the target level of 5% set for biofuels by 2010 but 3% is realistic, considering biofuel availability and costs. On 9 June 2006, the minister working group on climate and energy issues defined an indicative target of 5.75 % for 2010.

This biofuels obligation would apply to all companies supplying transport fuels to the Finnish market. However, each supplier is free to decide how it will deliver the required biofuel percentage of all transport fuels supplied, and what biofuels it will use.

On 9 June 2006, the minister working group on climate and energy issues defined an indicative target of 5.75 % for 2010.

An obligation law is currently under preparation. The biofuel shares in the proposal are 2% in 2008, 4% in 2009, and 5.75% in 2010. The decision is expected to be made by the current Parliament (before March 2007) and it is planned to be in force starting from the beginning of 2008

Table 7.1 - Biofuel targets (% by energy)

Target year	Petrol	Diesel	Petrol + Diesel
2005			
2006			
2007			
2008			2%
2009			4%
2010			5.75%

Excise duty reductions

Under Directive 92/81/EEC on fuel taxation, partial excise duty relief was granted in Finland in 2002 for biofuels intended for research and experimental use. Two projects were run in 2002-2004 whereby tax on the bioethanol component in bioethanol and petrol blends was reduced by 30 cents/litre. The period set for the projects ended on 31 December 2004 and the projects were not extended. Tax reductions under the Directive on taxation of energy (2003/96/EC), which came into force in early 2004, have not at present been decided on.

In accordance with Article 15 of the Directive on the taxation of energy (2003/96/EC), natural gas and liquid gas may be exempted from tax where they are used as motor fuel. The Article has been taken as covering also methane of biological origin. Biogas for use as motor fuel is exempt from excise duty.

Biofuel obligations

An obligation law is currently under preparation as indicated in Table 7.1. The table below shows the proposed biofuel shares. This biofuels obligation would apply to all companies supplying transport fuels to the Finnish market. However, each supplier is free to decide how it will deliver the required biofuel percentage of all transport fuels supplied, and what biofuels it will use. The decision is expected to be made by the current Parliament (before March 2007) and it is planned to be in force starting from the beginning of 2008.

Fiscal incentives

Tax benefits for methane-fuelled vehicles:

In Finland, it is generally considered that the basis of implementation of biofuel directive should be in large-scale use of biofuels in current vehicles and fuel distribution channels. Supporting biofuel systems which require special vehicles and new distribution channels has not been considered sensible in the Finnish climate. Since gas-engine vehicles have high possibilities to decrease fine particle emissions especially in densely-populated areas, there are support actions in place for gas-engine vehicles and methane.

Taxation of personal and commercial vehicles running on methane was changed by the law on fuel taxation (1280/2003) which came into force in early 2004, so that gas consumption is no longer subject to the punitive value added tax previously applying. In addition to methane-using vehicles being exempted from fuel tax, personal and commercial vehicles have correspondingly been granted exemption also from the power output taxation imposed under the vehicle taxation law (1281/2003), which otherwise is charged on all motor vehicles using fuels taxed less heavily than petrol, e.g. diesel-driven vehicles.

*Investment subsidies*Energy support:

The aim of investment support payments and other forms of funding with the energy support granted by the Ministry of Trade and Industry to businesses and companies is to promote the use of renewable energy sources such as bioenergy, energy saving and the associated commercialization of new technology. The amount of energy support granted in 2004 was EUR 33.5 million. In recent years, the most notable target of support has been wood energy use, followed by wind power.

Other measures stimulating the implementation of biofuels

Not available

Promotion of second generation biofuels

In Finland, research and development work on transport biofuels is focused on the development of production technologies for second generation biofuels. The task force suggested a special development programme for developing Finnish technologies for second generation biofuels and introducing the technologies and the biofuels to the market. The Finnish government has suggested a 9 million € grant for this programme but no political decision on the programme has yet been made.

7.4 Market development and policy effectiveness

The table below shows the current use of biofuels in Finland. In 2004 the consumption of transport biofuels was based on two experimental projects, in which 5 vol-% ethanol was mixed with petrol. In Finland there is also small-scale production and use of biodiesel and biogas on an experimental basis as transport fuel, but the actual use of these biofuels is extremely restricted (a few cars only).

Table 7.2 - Biofuel development and market share, Finland

Production (Year)	Biodiesel (n/a)	Bioethanol (n/a)	PPO (n/a)	Biogas (n/a)	2nd-Gen (n/a)	Market share (%)
2000						
2001						
2002						
2003						0.1%
2004						0.1%
2005						n/a (<0.1%)
2006						
2007						
2008						2%
2009						4%
2010						5.75%

7.5 Sources

- ▶ Ministry of Industry and Trade, 2001. The Finnish National Climate Strategy. <http://www.ktm.fi/index.phtml?c=www&l=en&s=198,30.6.2005>
- ▶ Outline of the energy and climate policy for the near future – national strategy to implement the Kyoto Protocol. Government report to Parliament, 24 November 2005.4 p.
- ▶ Ministry of Trade and Industry, Energy Department, 2002. Action Plan for Renewable Energy 2003 – 2006, Proposal of the working group [Uusiutuvan energian edistämisohjelma 2003 – 2006, Työryhmän ehdotus] 54 p. (In Finnish).
- ▶ Report of the Finnish Ministry of Trade and Industry pursuant to directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport in Finland. 30.11.2004. http://ec.europa.eu/energy/res/legislation/doc/biofuels/member_states/2003_30_fi_report_en.pdf
- ▶ 2005 Report as provided for in directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport in Finland. 21.12.2005.

- ▶ http://ec.europa.eu/energy/res/legislation/doc/biofuels/member_states/2005_rapports/2003_30_fi_report_en.pdf
- ▶ Liikenteen biopolttoaineiden tuotannon ja käytön edistäminen Suomessa - Työryhmän mietintö (Promotion of the production and use of transport biofuels – Task force report). Ministry of Trade and Industry, Publications 11/2006, 138 p. <http://www.ktm.fi/> (in Finnish, English abstract)

8 Germany

8.1 Introduction

The main factors for the political motivation to promote the use of biofuels are the protection of the climate, the security of fuel supply, and the development of rural areas. In view of a fast-paced price development of crude oil and increasing geopolitical uncertainties, the security of energy supply does not only govern politics in Germany but around the globe. At present, energy policy is the most important topic in foreign affairs. As an element of the national energy supply, the German potential of biomass gains more and more in importance which is supposed to be reflected respectively in the biomass action plan announced by the German Government and the national overall strategy concerning any future energy policy. By doing so the German government reacts consistently to the EU Biomass Action Plan suggested by the EU Commission at the end of 2005 and the EU strategy for biofuels of January 2006.

8.2 Main drivers for biofuels policy

According to experts' opinion, for now, only biofuels (as an alternative to fossil fuels) will be able to contribute note worthily to secure mobility in the short to medium term. The Association of the German Automobile Industry (*VDA Verband der Deutschen Automobilindustrie*) underlined this fact in February when they self-imposed the obligation for the car industry to lay the technical foundations for a 10 % admixture of biofuels to Diesel fuel and gasoline. The introduction of biofuels is at least also necessary to meet the self commitment of the European association of the automobile industry (ACEA) to reduce the CO₂ emissions to 140 g/km. Pushed by the automotive industry the discussion has begun concerning the CO₂ -reduction potential of biofuels based on different raw materials. The automobile industry prefers synthetic biofuels from biomass (BTL). The advantages concerning the emission reduction potential are known based on results with GTL (Gas-To-Liquid), whereas the CO₂ reduction potential has to be investigated. So the challenge is to open the market to biofuels and at the same time to push the optimization of combustion engines in order to reduce fuel consumption and emissions.

8.3 Biofuels policy

Biofuel targets

In a document stating basic requirements (so-called *Eckpunktepapier*), which is supposed to function as a basic guideline for any tax exemption until 2012, the Coalition Government subsequently laid down the most important elements of the future framework conditions for a policy to promote biofuels. In principle, the German Federal Government will follow the strategy to combine tax privileges and administration law in order to meet the constraints regarding the consolidation of the Federal Budget as well as to meet the target quantities of the action plan of the European Union.

Table 8.1 - Biofuel targets (% by energy)

Target year	Petrol	Diesel	Petrol + Diesel
2005			
2006			
2007	1.2%	4.4%	-
2008	2.0%	4.4%	-
2009	2.8%	4.4%	6.25%
2010	3.6%	4.4%	6.75%
2011	3.6%	4.4%	7.00%
2012	3.6%	4.4%	7.25%
2013	3.6%	4.4%	7.50%
2014	3.6%	4.4%	7.75%
2015	3.6%	4.4%	8.00%

*Excise duty reductions**Table 8.2 - Excise duty reductions (€/L biofuel)*

Biofuel	Ethanol (sugar, starch)		ETBE	Biodiesel		PPO 100	BTL* blend	Ethanol (cellulosic)	
	E85	blend		B100	blend				
Year									
2000	-	-	-	-	0	-	0	-	-
2001	-	-	-	-	0	-	0	-	-
2002	-	-	-	-	0	-	0	-	-
2003	-	-	-	-	0		0	-	-
2004	0.65	0.65	0.65	0.47	0.47		0.47	0	-
2005	0.65	0.65	0.65	0.47	0.47		0.47	0	-
2006									
To July 31	0.65	0	0	0.47	0.47	0.47	0.47	0	-
From Aug 1				0.38	0.32				
2007	0.65	0	0	0.40	0	0.47	0	0.47	0.65
2008	0.65	0	0	0.34	0	0.39	0	0.47	0.65
2009	0.65	0	0	0.27	0	0.30	0	0.47	0.65
2010	0.65	0	0	0.21	0	0.22	0	0.47	0.65
2011	0.65	0	0	0.15	0	0.15	0	0.47	0.65
2012	0.65	0	0	0.02	0	0.02	0	0.47	0.65
2013	0.65	0	0	0.02	0	0.02	0	0.47	0.65
2014	0.65	0	0	0.02	0	0.02	0	0.47	0.65
2015	0.65	0	0	0.02	0	0.02	0	0.47	0.65

* Annual proof of overcompensation required

Use of biodiesel and plant oil by farmers is fully tax exempted.

Precondition for tax privilege for:

- ▶ Biodiesel – DIN EN 14214
- ▶ Vegetable Oil – DIN V 51605

Biodiesel generated from animal fats for pure fuel use:

- ▶ tax privileges are limited until December 31, 2011

No taxation until 2015 for:

- ▶ Synthetic biofuels (biomass to liquid – btl)
- ▶ Bioethanol based on hemicellulose
- ▶ E85 (blend of 85 % bioethanol, 15 % gasoline)

Subject to an annual revision regarding overcompensation

Consensus essential of the Ministries of Agriculture, Environment, Traffic and Economy concerning minimum criteria for a sustainable farming of agricultural areas or/and the conditions to save carbon dioxide/CO₂.

8.4 Amendment of the Federal Emission Control Act / Bundes-Immissionsschutzgesetz

Introduction of biofuel quotas (bonded warehouses/free circulation) for:

- ▶ Producers and traders of Diesel fuel and gasoline
- ▶ Producers of biofuels (biodiesel, vegetable oils)

Preconditions for Tax Privileges and Eligibility concerning Quota Obligation:

Biodiesel	– DIN EN 14214
Pflanzenöl	– DIN V 51606
Bioethanol	– 99 vol % alcohol content

Vegetable oils used directly in the refining process are not eligible.

New/innovative technologies are accepted, e.g. hydrogenation of vegetable oils according to the „Neste-Oil-Process“ („NextBTL).

Regulation of sanctions in case of non-compliance (based on caloric value)

- ▶ Diesel / biodiesel: 19 €/GJ (60 Cents/litre)
- ▶ Gasoline / bioethanol: 43 €/GJ (90 Cents/litre)
- ▶ Additional overall quota: 19 €/GJ

Comment:

It must be stated that the partial tax rates for biodiesel and vegetable oil and the final tax rates (45 Cents/litre) are too high in order to be able to guarantee a competitiveness of pure biofuels. At present Diesel fuel (DIN EN 590) must not contain more than 5 vol % of FAME. In Germany the total annual consumption of Diesel fuel amounts to 29 million tonnes. As a result, an alternative to use up the existing biodiesel capacity of about 3.4 to 3.7 million tonnes cannot be achieved.

A rise of the overall quota to 10 vol % after 2009, only by utilizing biodiesel as a blending component (B10), requires the review of the European Standard for Diesel fuel – EN 590 – or the introduction of a new standard for B10. This is likely to be unrealistic facing the multitude of unresolved questions concerning the performance of biodiesel proportions in Diesel fuel of up to 10 % in old vehicles (e.g. elastomers in sealing gaskets of fuel injection pumps, particle filter systems supported by additives, equipment at filling stations).

Biofuel obligations

The fact that first of all now biodiesel and vegetable oil producers are also obliged to meet quantity targets, should they bring biofuels into the free market, leads to a so-called “fictitious” quota (4.4 % on energy basis). As a result, 5 vol % of any sold biofuel are fully taxable (47 Cents/litre) which leads to an additional “tax burden” of about 2.3 Cents per litre of biodiesel or vegetable oil.

Fiscal incentives

Not available

Investment subsidies

Not available

Other measures stimulating the implementation of biofuels

Not available

Promotion of second generation biofuels

See section ‘Excise duty reductions’.

8.5 Market development and policy effectiveness

In Germany the tax exemption was very successful. The success has a negative side which is the decreased tax levy by the government. Besides, due to increasing oil prices, biodiesel and pure plant oil was slightly over-stimulated. This has led to a policy change end of 2005 and in 2006: introduction of partial taxation and a biofuel obligation followed by reduction of the tax exemption.

Table 8.3 - Biofuel development and market share, Germany

Production (Year)	Biodiesel (000 L/a)	Bioethanol (000 L/a)	PPO (n/a)	Biogas (n/a)	2 nd -Gen (n/a)	Market share (%)
2000	289,296					
2001						
2002	529,200					
2003	840,840					
2004	1,217,160					
2005	1,962,744	<i>600,000</i>				3.75%
2006						
2007						
2008						
2009						
2010						

Source: EBB (2006), Berg (2004). *Grey italicized figures are predicted values.*

8.6 Sources

- ▶ www.ufop.de
- ▶ www.agqm-biodiesel.de
- ▶ European Biodiesel Board. 2006. Statistics - The EU Biodiesel Industry. Available online at <http://www.ebb-eu.org/stats.php>
- ▶ Berg, C. 2004 World Ethanol Markets, Analysis and Outlook 2004. Ratzeburg, Germany: FO-Licht, September 2004.

9 Greece

9.1 Introduction

Greece is in the initial stage of introducing biofuels in the local fuel market.

9.2 Main drivers for biofuels policy

9.3 Biofuels policy

Biofuel targets

The national target for biofuels for year 2010 is set to 5.75% by heat content, according to Directive 2003/30/EC. The national target for year 2006 is estimated to be 1.2%.

Excise duty reductions

Law 3423/2005 concerning the introduction of biofuels and other renewable fuels and implementing Directive 2003/30/EC, was put into force in December 2005. This Law amends previous Law 3054/2002 concerning the use, distribution and control of fuels in the local market. With the new provisions, the Biofuels Distribution License is introduced, as well as an annual quotation scheme of biofuels exempted from Excise Duty is put into place. Furthermore, refineries are obliged to receive all biofuels under the quotation scheme and exempted from Excise Duty, mix them with the relevant fossil fuels and distribute them in the local market. Meanwhile, in article 34 of Law 3340/2005 full exemption from Excise Duty has been anticipated for specific quantities of biodiesel for the years 2005 (51,000 m³), 2006 (91,000 m³) and 2007 (114,000 m³).

Biofuel obligations

Not applicable

Fiscal incentives

Not available

Investment subsidies

Not available.

Other measures stimulating the implementation of biofuels

Standards EN 14214, EN 590:2004 and EN 228:2004 have been incorporated in the national legislation.

Promotion of second generation biofuels

Not available.

9.4 Market development and policy effectiveness

Currently, only biodiesel is distributed in the local fuel market. In this first stage, all biodiesel is mixed in refineries with automotive diesel at a percentage of about 2% by volume and distributed as mixture in the local fuel market. At a later stage, mixtures of higher percentage of biodiesel in automotive diesel, even over 5% by volume, as well as pure biodiesel, will be introduced in the local fuel market, after some legislative and technical aspects have been resolved.

The first local biodiesel production plant, with an annual capacity of 40,000 tons, has started operating in November 2005. Two more plants, with annual capacities of 40,000 and 25,000 tons respectively, are ready to start operation in the upcoming period. Two more plants, with annual capacities of 40,000 and 250,000 tons respectively, are under construction and expected to operate in September 2006. Several other plants, most of them with annual capacities of 5,000 and 10,000 tons, are in the design stage. These plants are located in several regions of Greece. More details will be available later this year.

Regarding bioethanol, its introduction in the local fuel market is expected for the second semester of 2007, since it is a more complicated and technically intensive matter.

All the above mentioned plants, are using imported (soybean oil, rapeseed oil, etc.) as well as local feedstock (cottonseed oil, used cooking/frying oils, etc.). Meanwhile, efforts have been increased to multiply local cultivation of energy crops in several regions of Greece.

Table 9.1 - Biofuel development and market share, Greece

Production (Year)	Biodiesel (000 L/a)	Bioethanol (n/a)	PPO (n/a)	Biogas (n/a)	2nd-Gen (n/a)	Market share (%)
2000						
2001						
2002						
2003						
2004						
2005	3,528					
2006						
2007						
2008						
2009						
2010						

Source: EBB (2006), *Grey italicized figures are predicted values.*

9.5 Sources

More details on the above subjects will be available in the upcoming National Report on Biofuels.

- ▶ European Biodiesel Board. 2006. Statistics - The EU Biodiesel Industry. Available online at <http://www.ebb-eu.org/stats.php>

10 Lithuania

10.1 Introduction

In 2004, Lithuanian road transport used over 1 million tonnes of mineral fuels, of which about 30% is petrol and almost 55% is diesel fuel. The remainder of the fuel mix consists of liquefied petroleum gas.

In Lithuania the Energy Development Strategy specifies perspectives of local, renewable, waste energy resources. It is specified that hydropower is one of the most important renewable energy resource. Geothermal energy is very perspective also. The highest wind energy potential is in the West and North Lithuania, especially in the Baltic Sea sector. Solar energy will have certain energy production potential in the future.

The purpose of the 'Programme to encourage the production and use of biofuel in 2004-2010' (approved by Resolution of the Government of the Republic of Lithuania, *Official Gazette*, 2004, No 133-4786) is to ensure the development of biofuel production from raw materials originating in the Republic of Lithuania, as well as the use of biofuel. An important objective is to increase the production of electric power generated using biogas, wood and straw by the year 2010; encouraging the cultivation and preparation of raw materials for biofuel; promoting the use of biofuel; promoting research into biofuel production and use; and introducing measures for training, information and consulting on biofuel issues.

10.2 Main drivers for biofuels policy

The main drivers for biofuel policies in Lithuania are reducing the dependence of fossil fuel imports and CO₂ emissions from transport.

10.3 Biofuels policy

Biofuel targets

The provisions of Directive 2003/30/EC have been transposed into the Republic of Lithuania Law on Biofuel, Biofuels for Transport and Bio-Oils, Article 8(3). This Law required measures to be introduced to ensure that by 31 December 2005 the proportion of biofuels for transport amounted to at least 2%, calculated on the basis of energy content, of all petrol and diesel for transport purposes placed on the national market, and – by 31 December 2010 – at least 5.75%.

Table 10.1 - Biofuel targets (% by energy)

Target year	Petrol	Diesel	Petrol + Diesel
2004			0.022% ^(A)
2005			0.72% ^(A)
2006			2-5.75 %
2007			2-5.75 %
2008			2-5.75 %
2009			2-5.75 %
2010			5.75%

^(A) De Facto biofuel share calculated on the basis of energy content. For 2005, the target for biofuels was 2%, but de facto the biofuels share reached only 0.72%.

Excise duty reductions

Tax exemptions for biofuels in Lithuania are of recent date. With regard to Council Directive 2003/96/EC of 27 October 2003 (restructuring the Community framework for the taxation of energy products and electricity) and without prejudice to Article 16 of this Directive allowing Member States to apply a reduced rate of excise tax on the products produced from biomass or products containing biomass and to exempt from the excise tax on certain terms, Lithuania began applying a reduced rate of excise tax on biofuels for transport. The measure applied is state aid as defined in Article 87(1) of the EC Treaty. The aid is provided by the State of Lithuania and financed from its own public resources because the tax exemption results in reduced revenues

that would otherwise be received by the state budget. As the excise rate reduction on biofuels for transport is treated as state aid, Lithuania notified the European Commission, in line with the set procedure, of its intentions to reduce the excise tax on biofuels and got approval for that state aid (State Aid No: N44/2005 - Lithuania. Excise tax reduction on biofuels.

On 15 December 2005, the Seimas of the Republic of Lithuania adopted the Law Supplementing and Amending the Law on Excise Duty (*Official Gazette*, 2005, No 153- 5633), providing for excise relief (zero excise rate) on dehydrated ethyl alcohol.

Table 10.2 - Excise duty reductions (€/L biofuel)

Year	Ethanol (sugar, starch)		ETBE	Biodiesel		PPO	BTL	Ethanol (cellulosic)
	E85	blend		B100	Blend			
2005		0.27 ^(A)			0.24 ^(B)	100	blend	
2006								
2007								
2008								
2009								
2010								

* 3% FAME

(A) Ethanol with GN-code 2207 10 00, tax reduction is €9.45 per 1000 litre fuel containing 3.29 vol-% ethanol.

(B) Biodiesel with GN-code 3824 90 99, tax reduction is €7.36 per 1000 litre fuel containing 3 vol-% biodiesel.

Biofuel obligations

To implement the objectives of Directive 2003/30/EC the following national legal acts governing the mandatory use of biofuels for transport in Lithuania have been adopted:

- ▶ The amendment of the 'Rules for trade in petroleum products, biofuel, bio-oil and other flammable liquid products in the Republic of Lithuania', as approved by Order No 4-106 of the Minister of Economy of the Republic of Lithuania of 14 March 2005;
- ▶ Order No 4-96/D1-139/3-77 of the Minister of Economy, the Minister of Environment and the Minister of Transport and Communications of the Republic of Lithuania of 9 March 2005 'On the amendment of Order No 4-105/131/3-172 of the Minister of Economy, the Minister of Environment and the Minister of Transport and Communications of the Republic of Lithuania 'On the approval of mandatory quality indicators of petroleum products and liquid fuel used in Lithuania.'

The legal acts stipulate that, as of 31 December 2005, new requirements will be applicable to the fuels sold and consumed in Lithuania: 95 RON motor petrol must be produced using the additive ETBE, while 95 RON motor oil, imported or brought in and sold or consumed in the country but produced without using ETBE, must contain 3% or 5% of bioethanol. Diesel fuel must contain 3% or 5% of fatty acid methyl ester (FAME) produced from vegetable oils or fats of animal origin. Mandatory mixing was introduced with the general consensus of all the interested parties in the market in fuels for transport.

Fiscal incentives

Exemption from the environment pollution tax:

Republic of Lithuania Law on Environment Pollution Tax (*Official Gazette*, 2002, No 13-474; 2005, No 47-1560) (in force since 1 January 2006) provides for an exemption from the environment pollution tax for:

- ▶ natural and legal entities polluting through vehicles using biofuels that comply with the established standards and having submitted the documents confirming that such fuels were indeed used;
- ▶ natural and legal entities that have produced the documents confirming that biofuel was indeed used, for the emissions building up when using biofuel.

Investment subsidies

Not available.

Other measures stimulating the implementation of biofuels

Promotion of the development of biofuel production by making agricultural produce available for non-nutritional applications:

The 'Rules for financing the development of the production of biofuels for transport', as approved by Order of the Minister of Agriculture providing for promotion of the development of biofuel production by making agricultural produce available for non-nutritional applications. Under these Rules, the producers of biofuels may claim in 2005 payments for cereals that are used for production of biofuel: refunds of LTL 160 per tonne of rape grain and LTL 60 per tonne of cereal grain. The 'Rules for financing the development of the production of biofuels for transport in 2005' stipulate that the maximum refundable amount of rape grain in 2005 is 33,000 tonnes, and 22,084 tonnes in the case of cereal grain.

Promotion of second generation biofuels

At this moment, there are no activities in Lithuania regarding second generation biofuels.

10.4 Market development and policy effectiveness

The production of transport biofuel is at its initial stage in Lithuania. The adoption of the Law Supplementing and Amending the Law on Excise Duty on 15 December 2005 providing for excise relief on dehydrated ethyl alcohol resulted in better economic terms for the production of biofuels for transport.

There are two companies in Lithuania that produce transport biofuel, Stumbras (bioethanol) and JSC Rapsoila (biodiesel). Part of their output is exported, part of it is stored in the company's tankers and only small amounts of transport biofuel are used in the production of mineral fuel and transport biofuel blends. In 2005 Lithuania exported 6440 tonnes of bioethanol and 4400 tonnes of biodiesel. In 2004 the export amounted to only 680 tonnes of bioethanol and 200 tonnes of biodiesel.

Table 10.3 - Biofuel development and market share, Lithuania

Production (Year)	Biodiesel (tonnes)	Bioethanol (tonnes)	PPO (n/a)	Biogas (n/a)	2nd-Gen (n/a)	Market share (%)
2000						
2001						
2002						
2003						
2004	2,200	1,900				0.022%
2005	7,000	6,000				0.72%
2006						
2007						
2008						
2009						
2010						

10.5 Sources

- ▶ Law on Biofuel, Biofuels for Transport and Bio-Oils (adopted by the Seimas of the Republic of Lithuania on 5 February 2004, *Official Gazette*, 2004, No 28-870) http://www3.lrs.lt/pls/inter2/dokpaieska.showdoc_l?p_id=243625 (English)
- ▶ The amendment of the 'Rules for trade in petroleum products, biofuel, bio-oil and other flammable liquid products in the Republic of Lithuania', as approved by Order No 4-106 of the Minister of Economy of the Republic of Lithuania of 14 March 2005; http://www3.lrs.lt/pls/inter2/dokpaieska.showdoc_l?p_id=131243
- ▶ Order No 4-96/D1-139/3-77 of the Minister of Economy, the Minister of Environment and the Minister of Transport and Communications of the Republic of Lithuania of 9 March 2005 'On the amendment of Order No 4-105/131/3-172 of the Minister of Economy, the Minister of Environment and the Minister of Transport and Communications of the Republic of Lithuania 'On the approval of mandatory quality indicators of petroleum products and liquid fuel used in Lithuania. http://www3.lrs.lt/pls/inter2/dokpaieska.showdoc_l?p_id=252387

- ▶ Law on Excise Duty (*Official Gazette*, 2001, No 98-3482; 2004, No 226-802)
http://www3.lrs.lt/pls/inter2/dokpaieska.showdoc_l?p_id=160467 (English)
- ▶ www.zum.lt

11 Netherlands

11.1 Introduction

In comparison with other European countries, natural gas plays a very important role in the Dutch energy supply system. Both on-land and in the North sea, large natural gas reserves are exploited. As a result, natural gas is the major fossil fuel for production of electricity and heat.

The national energy policy aims to secure energy supply for the future and reduce emissions from the energy sector. The Netherlands has adopted the following official policy goals:

- ▶ A share of 9% renewables in electricity production in 2010 (according to EU Renewable Electricity Directive). In 2005, the share of renewables was 6.2% with a two-third contribution from bioenergy.
- ▶ A share of 10% renewables in overall energy supply in 2020. Currently (2005) this share is 2.4%.

11.2 Main drivers for biofuels policy

The main driver for biofuel policies in Netherlands is to decrease the CO₂ emissions from transport. For all sectors except transport, CO₂ emissions have decreased over the last years. Other drivers like security of supply and an opportunity for people in rural areas have been mentioned but are of less importance in The Netherlands.

11.3 Biofuels policy

Biofuel targets

The table below presents the biofuels targets adopted by the Netherlands (for more information, see 'Biofuel obligations').

Table 11.1 - Biofuel targets (% by energy)

Target year	Petrol	Diesel	Petrol + Diesel
2005	-	-	-
2006	-	-	2%
2007	2%	2%	2%
2008	2.5%	2.5%	3.25%
2009	3%	3%	4.5%
2010	3.5%	3.5%	5.75%

Excise duty reductions

Since 2003, a tax exemption has been granted on a project basis for pure biofuels (three projects on pure plant oil and one on biodiesel). The total amount of PPO and biodiesel that can benefit from this exemption is limited to 7.5 million litres per year. New projects cannot apply for this tax exemption.

In 2006, a general tax reduction was given for maximum of 2 vol% of biodiesel and ethanol, blended in diesel and petrol, respectively. This tax reduction ended per 31-12-2006 as it was replaced by a mandatory market share (biofuel obligation). The legal text of the tax reduction mentioned the specific GN codes for biodiesel (GN-code 3824 90 99) and ethanol (GN-code 2207 10 00). To obtain the tax exemption, blending was only allowed inside an excise warehouse and under the condition that an administrative balance on the amount of biofuels was kept.

Tax exemption in Euro/litre biofuel (ended per 31-12-2006)

Table 11.2 - Excise duty reductions (€/L biofuel)

Year	Ethanol (sugar, starch)		ETBE	Biodiesel		PPO
	E85	blend		B100	Blend	
2002						
2003						0.365 ^(B)
2004				0.365 ^(A)		0.365 ^(B)
2005				0.365 ^(A)		0.365 ^(B)
2006		0.505 ^(C)	0.505 ^(C)	0.365 ^(A)	0.305 ^(D)	0.365 ^(B)
2007				0.365 ^(A,E)		0.365 ^(B,E)
2008				0.365 ^(A,E)		0.365 ^(B,E)
2009				0.365 ^(A,E)		0.365 ^(B,E)
2010				0.365 ^(A,E)		0.365 ^(B,E)

(A) Tax exemption granted for one project, maximum about 0.5 million litres per year

(B) Tax exemption granted for three projects, maximum 7 million litres per year

(C) Ethanol with GN-code 2207 10 00, tax reduction is €10,10 per 1000 litres fuel containing 2 vol% ethanol or more, lower percentages receive a proportionally lower tax reduction.

(D) Biodiesel with GN-code 3824 90 99, tax reduction is € 6,10 per 1000 litres fuel containing 2 vol% biodiesel or more, lower percentages receive a proportionally lower tax reduction.

(E) A partial tax (5 €-cents per litre) has been debated during spring 2006. It was cancelled with the reservation that the European Commission agrees to the full tax exemption.

Biofuel obligations

As of 1-1-2007, a biofuel obligation is in place in The Netherlands. Obligated parties are the oil companies that bring petrol and diesel from excise warehouses onto the Dutch fuel market. The obligated parties have to show administratively that 2% (by energy) of their total amounts of petrol and diesel sold consist of biofuel. Therefore, the obligation refers to an overall market share and is not a blending obligation (every litre has to contain 2% of biofuel).

The obligation must be met for petrol and diesel separately to ensure that biofuels will be developed in both markets. Suppliers must maintain records, which show they are complying with their obligations. The record system will be the same as is being used in 2006 for the tax incentives.

Obligated parties may administratively buy biofuel rights from other obliged parties and also from non-obliged parties, which have brought biofuels (like B100, PPO, E85 or biogas) onto the Dutch fuel market. The obligation has to be fulfilled within a calendar year, meaning that it is not allowed to use surpluses in a next period or to partly fulfill the obligation of a given year with biofuels brought onto the market in the first months of the next year. If suppliers do not comply with the obligation, they will be subject to a financial penalty. The Government is considering to introduce a 'buy-out' system in the near future (phase 2 of the obligation).

It was announced that phase 2 of the regulation (all mentioned above is phase 1), which is to be completed within a year after phase 1, will implement Dutch policy on innovation, sustainability and certification. This will be harmonized closely with international developments.

Fiscal incentives

Tax relief for investments: EIA

Biofuel projects can benefit from EIA, a tax relief programme that gives a direct financial advantage to Dutch companies that invest in energy-saving equipment and sustainable energy. A maximum of 44% of the annual investment costs of such equipment (purchase costs and production costs) is deductible from the fiscal profit over the calendar year in which the equipment was procured. Depending on the profit of the company, the benefit from EIA can range from 0% to almost 15% of the total investment costs.

Investment subsidies

Not available.

Other measures stimulating the implementation of biofuels

Not available.

*Promotion of second generation biofuels*Obligation:

The Dutch government policy will be directed towards seeing that more innovative biofuels, which are often based on waste streams or woody crops, are commercialized as quickly as possible. This will initially be stimulated through the a subsidy for innovative projects (see below). For the future, the Dutch government intends to create a viable market for more advanced biofuels by rewarding biofuels with a good life cycle CO₂ performance in the proposed system. This can be done by giving greater weight to more advanced biofuels in the biofuel obligation, or by specifying that part of the obligation must comprise more advanced biofuels.

Subsidy:

Starting end of 2006, a subsidy will be available for projects aimed at production of second generation biofuels, including biofuels that are not themselves second generation but represent a step towards the second generation. A sum of € 60 million has been reserved for the period 2006 to 2010. The eligibility of projects for subsidy will be tested against the following criteria (in order of importance):

1. reduced greenhouse gas emissions on a life cycle basis and lower land-use;
2. market potential and likelihood of success, allowing for the learning curve;
3. subsidy effectiveness;
4. other positive environmental effects.

These criteria are intended to select projects which maximize CO₂ reduction and have a good chance of surviving in the market once the subsidy has finished (given the biofuel component in the general policy component). Priority will be given to the best scoring projects.

11.4 Market development and policy effectiveness

Up to 2005, the development in biofuel use in The Netherlands was limited to the four biodiesel and PPO projects that received a tax exemption. The amount of biofuels on the Dutch market was a few million litres per year. The tax exemption in 2006 has caused so far (status by June 2006) that one of the large Dutch oil companies blends 2% of biofuel in both petrol (as ETBE) and diesel (as biodiesel according to standard EN 14214). Besides, many initiatives exist for production of bioethanol (several 100 Ml/year) and biodiesel (several 100,000 tons/year). Decisions to build these plants are expected within the next months to year.

Table 11.3 - Biofuel development and market share, Netherlands

Production (Year)	Biodiesel (tonnes)	Bioethanol (tonnes)	PPO (n/a)	Biogas (n/a)	2nd-Gen (n/a)	Market share (%)
2000						
2001						
2002						
2003						
2004						
2005						
2006						
2007						
2008						
2009						
2010						

11.5 Sources

- ▶ Tax law, article 72a on biofuels ("Wet op de accijns m.b.t. biobrandstoffen, art. 72a)
- ▶ Policy letter on biofuels of Government to parliament - March 2006.
- ▶ www.senternovem.nl/gave
- ▶ Besluit van 20 oktober 2006, houdende regels met betrekking tot het gebruik van biobrandstoffen in het wegverkeer (Besluit biobrandstoffen wegverkeer 2007)

12 South Africa

12.1 Introduction

Not available.

12.2 Main drivers for biofuels policy

Not available.

12.3 Biofuels policy

Biofuel targets

Not available

Excise duty reductions

Biodiesel Fuel Tax Concession

Transport fuels classified as fuel levy goods in South Africa are subject to the full range of fuel taxes but are zero rated for VAT purposes. The taxes applied are: the General Fuel Levy, Road Accident Fund Levy, Customs and Excise duty, and the Equalisation fund levy.

- ▶ The General fuel levy is used to fund general government expenditure;
- ▶ The road accident fund levy is earmarked to the road accident fund and is used to finance motor vehicle accident claims;
- ▶ The customs and excise levy is used to finance development in the BLNS (Botswana, Lesotho, Namibia and Swaziland) countries; and
- ▶ The equalization fund levy is used for fuel price smoothing and was previously used to finance the development of the synthetic fuels industry.

In 2002, the biodiesel fuel tax concession of 30 per cent was awarded to biodiesel and in the 2006 Budget this concession was increased to 40 per cent. The concession was implemented on the 1 April 2006. Biodiesel is therefore classified as a fuel levy good and subject to the full range of fuel taxes discussed above however, zero rated for VAT purposes (See Table 1 below for specific fuel tax rates that are applicable).

Table 12.1 - Current fuel tax regime - Fuel Tax Rates 2006/07 in SAR / litre*

Taxes	Petrol	Diesel	Biodiesel
General Fuel Levy	1.16	1.00	0.6
Road Accident Fund	0.365	0.365	0.365
Customs & Excise Levy	0.04	0.04	0.04
Equalisation Fund Levy	-	-	-

*South African Rand (SAR). Currency conversion factor: 1€ = SAR 9.19

Biofuel obligations

Not available.

Fiscal incentives

Accelerated Depreciation Allowance for Biofuels Production:

An additional incentive to encourage the production of biofuels in South Africa, that is biodiesel and bioethanol, was introduced in 2004. Plant and machinery used to produce biofuels qualifies for a 50:30:20 per cent write-off over a 3-year period. The exact wording of the incentive (taken from the Income Tax Act Handbook 2005-06) is as follows:

12B. Deduction in respect of certain machinery, plant, implements, utensils and articles:

(1) in Respect of any –

(g) Machinery, plant, implement, utensils or article which was or is brought into use for the first time by the taxpayer for the purpose of his or her trade to be used for the production of biodiesel or bioethanol.

(2) the deduction contemplated above shall be calculated on the cost to the taxpayer of the asset as referred to in Subsection 3.
(Source: *Income Tax Act Handbook 2005-2006*).

Table 12.2 - Excise duty reductions (€/L biofuel)

Year	Ethanol (sugar, starch)		ETBE		Biodiesel		PPO
	E85	blend			B100	Blend	100
2002							
2003							
2004							
2005							
2006					0.065 ^(A)		
2007							
2008							
2009							
2010							

^(A) Tax on use of pure biodiesel as a transport fuel is € 0.065 per liter
(Currency conversion factor: 1€ = SAR 9.19)

Investment subsidies

Not available.

Other measures stimulating the implementation of biofuels

Not available.

Promotion of second generation biofuels

Not available.

12.4 Market development and policy effectiveness

Not available.

12.5 Sources

- ▶ *Customs and Excise Act*
Lexis Nexis, Professional Tax Handbook 2005/06 for Income Tax Exemptions and Laws.
- ▶ South African Revenue Service - NO. R.305.
Customs and Excise Act, 1964. Amendment of Rules. (NO. DAR/18). 2006-03-31.
- ▶ South African Revenue Service - NO. R.306.
Customs and Excise Act, 1964. Amendment of Rules. (NO. DAR/19). 2006-03-31.
- ▶ Documents related to Customs and excise rules can be accessed from the South African Revenue Services website www.sars.gov.za.
- ▶ Documents related to tax policy regime for biofuels can be obtained from the National Treasury website www.treasury.gov.za.

13 Spain

13.1 Introduction

Approximately half of the energy used in Spain is oil based. Spain is scarce in domestic energy sources, only coal is produced domestically in significant amounts. Renewable energies covered 5.9% of the Spanish primary energy consumption and 16.6% (including also large hydropower) of the power production. At the present time, renewable energies employ around 180,000 people, most of them in economically depressed rural areas. Renewables receive different types of State aids (premium prices to their electrical production, fiscal support of investments and exemptions) to facilitate their technological development. The promotion of renewables is one of the vectors of the Spanish energy policy, which is materialized in the existence of concrete objectives for each technology. The last document that gathers these objectives, as well as the measures necessary to obtain them, is the Renewable Energies Plan 2005 - 2010 (PER). According to PER, in 2010 renewables must cover 12% of the primary energy consumption of the country, 29.4% of the power generation and 5.75% of the necessities of the transport.

Consumption of diesel in Spain increases from 14.3 Mtoe in 1998 to 23.3 Mtoe in 2005. However, gasoline consumption decreases from 9.4 Mtoe in 1998 to 7.6 Mtoe in 2005. This means that fuel transport consumption in Spain is increasing with an annual average of 4%.

13.2 Main drivers for biofuels policy

Main arguments for the use of biofuels are: reduction of greenhouse gas emissions, security of supply and development of the agricultural sector. These three have played a relevant role in the development of the bioethanol and biodiesel sector in Spain. The development of the agricultural sector may have been the most important one, not so much because of an agricultural lobby, but more from the viewpoint of regional development. The choice for ETBE instead of bioethanol direct blend was strongly influenced by oil companies.

13.3 Biofuels policy

Biofuel targets

After the adoption of the EU Biofuel Directive, Spain has notified the Commission that it has set its national indicative target at 2% for 2005. Also in line with the Directive, in August 2005 the country adopted the 'Plan for Renewable Energy 2005-2010'. According to this plan, the amount of biofuels will rise to 2.200 Mtoe in 2010, approximately 6% of the foreseen amount of transport fuels used in Spain in 2010. Besides the current feedstocks of barley, wheat, wine alcohol and waste vegetable oil, it is foreseen that that virgin plant oils could account for approximately half of the target for 2010. Since these are hardly used now, mainly because of their high local production costs, measures are proposed to promote virgin plant oil production.

Table 13.1 - Biofuel targets (% by energy)

Target year	Petrol	Diesel	Petrol + Diesel
2005			2%
2006			
2007			
2008			
2009			
2010			ca. 6%

Excise duty reductions

Fiscal incentives, in Tax on Hydrocarbons, for biofuels commercialization were established in Law 22/2005. It establishes that until end of year 2012, the rate of the Hydrocarbons Tax for biofuels will be of zero euros per 1000 liters. This special rate will be exclusively applied to the biofuel volume contained in the mixture.

Additionally, there exist an indirect tax called 'Tax on the retail sales of certain hydrocarbons' with two sections: a national section with a rate of 24€ per 1000 liters: and, a regional section (Madrid, Asturias, Galicia, Cantabria) with a rate of 24 €/1000 liters.

Biofuel obligations

No biofuel obligations have been introduced in Spain.

Fiscal incentives

Detaxation for biofuel pilot plants:

By a December 2002 change in the law on Tax, Administrative and Social Measures, all biofuel pilot plants receive a full detaxation for five years and all industrial plants receive a full detaxation until at least December 2012.

Tax benefit for investment in biofuel production:

Besides, Law 36/2003 created special fiscal deduction in the Company Income Tax. It can be deducted 10% in the down payment for investments made in equipments and installations to convert agricultural products in biofuels.

Investment subsidies

Subsidy to biofuel R&D projects:

The Spanish government has granted a subsidy of 22 million Euros to a biodiesel R&D project of a number of Spanish companies, including Repsol. The objective of the project is to reduce production costs and select and test new biomass feedstocks, including seaweed, waste cooking oils, and animal fats.

Other measures stimulating the implementation of biofuels

Support for farmers:

Farmers can receive, depending of the crop, a grant of 45 €/ha for growing energy crops, until the total surface in the EU devoted to energy crops do not exceed 1.5 Mha. The alternative to use set-aside land to grow energy crops in Spain has not been very successful, since productivity is around one-third less than in Germany or France, and compensatory grant received up to 2.5 less than in those countries.

Promotion of second generation biofuels

Spain does not have any particular promotion plan or target for the utilization of second generation biofuels. Few R&D project have been funded by the Spanish research policy (1 in 2004, 2 in 2005 and 3 in year 2006). They are mostly concentrated in the conversion of lignocellulosic biomass into ethanol; one has been funded to research biohydrogen production.

13.4 Market development and policy effectiveness

Biofuels consumption in Spain in 2005 was around 137 ktOE (113 ktOE of bioethanol and 24 ktOE of biodiesel), which means 0.5% of total consumption of transport fuels. This amount is only 15% of total necessary production for year 2010. Actual capacity installed is one-fourth of what is necessary to fulfill the objective of 5.75% for year 2010.

Table 13.2 - Biofuel development and market share, Spain

Production (Year)	Biodiesel (000 L/a)	Bioethanol (000 L/a)	PPO (n/a)	Biogas (n/a)	2nd-Gen (n/a)	Market share (%)
2000		225,000				
2001						
2002						
2003	7,056					
2004	15,288					
2005	85,848	521,000				
2006						
2007						
2008						
2009						
2010						

Source: EBB (2006), Berg (2004, 2001). *Grey italicized figures are predicted values.*

Existing capacity at the end of 2005 was 220 kton of bioethanol:

- ▶ Ecocarburantes españoles: IDAE (5%) and Abengoa (95%); starting in year 2000, uses cereals (barley and wheat, 300 kton/year) and wine alcohol, produces 51.2 Ktep/y (150 million liters), REPSOL and CEPESA are main customers and production is directed to ETBE conversion.
- ▶ Bioetanol Galicia: Abengoa (90%) and XesGalicia (10%); starting in 2002, uses cereals (barley and wheat, 340 kton/year) and wine alcohol, produces 54.5 Ktep/y (176 million liters), REPSOL and CEPESA are main customers and production is directed to ETBE conversion.

During year 2006 have entered or will enter into operation:

- ▶ Biocarburantes Castilla y Leon: Abengoa (50%) and Ebro Puleva (50%), starting in 2006, will use cereals (wheat and barley, 585 kton/y) and straw (60 kton/y), will produce 200 million liters, REPSOL and CEPESA are main customers and production is directed to direct blend at 5% (E5).
- ▶ Bioetanol de la La Mancha: Acciona Bioenergía (50%), will use wine alcohol, production of 33 million liters

Bioethanol projects planned for the next years:

- ▶ Bioethanol Zamora: Encalsa (51%), Sniace (30%, Ecoteo (14%), planned for 2007, will use cereals (barley and wheat 360 Mton/y), will produce 135 million liters.
- ▶ Bioetanol Torrelavega: Sniace, will produce 100 Mton ethanol
- ▶ Bioetanol Bilbao: Abengoa and EVE, will produce 126 Mliters.
- ▶ Bioetanol Miranda: Ebro-Puleva, for year 2009, will use sugar beet juices, will produce 100 Mliters ethanol.

Concerning biodiesel, currently there are nine biodiesel conversion plants in operation with an installed capacity of 472 kton/y. The total biodiesel production in Spain during 2005 was 71 ktons, but only 27.5 ktons were nationally consumed. The rest was exported to several European countries. During year 2006 have entered into operation the following three:

- ▶ GEN: Located in Lluçmajor (Mallorca). It was promoted by GEN (Grupo Ecológico Natural) with a total production of 32 million liters per year and using as raw materials: residual cooking oils (30%) and soybean imported from Argentina (70%).
- ▶ Biotel: Located in Barajas de Melo (Cuenca). The owner is Combustibles Ecológicos Biotel with a total production of 72 kton/year using as raw material animal fats and vegetal oils.
- ▶ Biocarburantes Almadén: Located in Almadén (Ciudad Real). It uses sunflower oil and other oleaginous vegetals, with a production capacity of 240 kton/y.

Biodiesel projects planned until year 2008 count an additional capacity of 2.1M ton/y. The main projects will be developed by a consortium of Spanish firms formed by Acciona and Repsol, with a foreseen investment of 300 M€ and a biodiesel production of 1 Mton/y.

The Plans of SEPI and Capital Energy (the joint company is Diesel Energy with 6 conversion plants in project phase, 150 Ktons each) are different from those of Acciona and Repsol. Probably, it makes sense to make an appointment with these two big plans. In the other two cases, Bio Oils Energy and the plant in Villaverde, you must consider that there are currently in project phase up to 55 different promotion projects only for biodiesel production in Spain.

13.5 Sources

- ▶ APPA (2005). Una estrategia de Biocarburantes para España 2005-10. www.appa.es
- ▶ PriceWaterhouseCoopers for National Association of Renewable Energy Producers, June 2005.
- ▶ Royal Decree 61/2006 about specifications for gasoline, diesel, fuel-oils and LPG and regulates the use of biofuels.
- ▶ Cobos J.M. (2006). Incentivos fiscales en favor de las energías renovables. Cuadernos de Energía, No. 12, pp. 47-59. Club Español de la Energía.

- ▶ AOP (2005). Posicion de AOP sobre el uso de biocarburantes. Asociación Española de Operadores de Productos Petrolíferos, April 2005.
- ▶ www.abengoabioenergy.com
- ▶ www.accion-energia.com
- ▶ www.biocarburantesclm.es
- ▶ www.bionorte.com
- ▶ www.bioneteuropa.com
- ▶ European Biodiesel Board. 2006. Statistics - The EU Biodiesel Industry. Available online at <http://www.ebb-eu.org/stats.php>
- ▶ Berg, C. 2001. World Ethanol Markets, Analysis and Outlook 2001. Ratzeburg, Germany: FO-Licht, October 2001.
- ▶ Berg, C. 2004. World Ethanol Markets, Analysis and Outlook 2004. Ratzeburg, Germany: FO-Licht, September 2004.

14 United States

14.1 Introduction

The primary biofuel used in the United States is ethanol from starch (mostly corn). While no new oil refineries have been built in the U.S. since 1976, more than 90 ethanol production facilities have been built during this time, adding critical volume to the biofuel market. Today, there are 94 ethanol plants in the United States, producing about 18.5 billion litres per year, with an additional 16 plants and 2.5 billion litres of capacity under construction. Within ten U.S. states, the ethanol industry has been credited with creating an estimated 200,000 new jobs, and generating \$500 million in annual tax receipts. These figures include direct employment within production facilities and also reflect increased employment on the farm and the creation of secondary jobs to provide equipment and services for these operations. In Minnesota, for instance, the use of a cooperative approach means that about 8,000 farmers have shares in ten ethanol plants. Over the past few years, biodiesel production in the US has also begun to rise.

14.2 Main drivers for biofuels policy

In the United States, the primary political drivers that support research programs and development of biofuel capacity are related to the economy and to energy security. Two agencies have become the primary implementing bodies for U.S. policies related to biofuels. The Department of Agriculture (USDA) has a mandate to increase rural employment, diversify agricultural economies and stimulate rural development by harnessing crops and crop residues and identifying new uses for this material. The Department of Energy (DOE) has a mandate to diversify the energy supply, expand the availability of renewable energy sources, and develop new technologies to exploit renewables in all forms.

The initial drivers for the industry were in part the oil shocks and rising prices of fuel, but today are dominated by a strong agricultural lobby which is interested in creating additional revenue streams for farmers. The US bioethanol industry uses corn, and to a lesser extent wheat, as a feedstock for wet- and dry-milling processes. A number of different policy options have been employed to help build the industry. Both federal and state governments have offered the industry direct funding in the form of public-private partnerships and research funds, as well as tax incentives and state-level renewable fuel mandates.

14.3 Biofuels policy

Biofuel targets

On January 23, 2007, the White House released an additional target which would increase the supply of renewable and alternative fuels to 35 billion gallons (132 billion litres) by 2017 - displacing 15% of projected annual gasoline use. This will partially achieve the goal of reducing US gasoline usage by 20% in the next 10 years (Twenty in Ten). For more information about short-term biofuels targets, see 'Biofuel obligations'.

Excise duty reductions

In the United States, both excise tax exemptions and sales tax exemptions are used as incentives for biofuel producers. Indiana offers the largest combined exemption on E10 fuels at \$0.034 US per litre. Of the largest ethanol-producing states, South Dakota and Iowa are the only two producing states that offer an additional exemption on state excise taxes. It may be inferred that excise tax exemptions provide a benefit for producers, but are not the deciding factor in determining where to install capacity for production. A summary of excise and sales tax exemptions is provided in the Table below.

Table 14.1 - Tax exemptions by state
(Total fuel excise tax rate, Exemption for E10 fuel blends) (¢/litre)

State	Excise tax (¢/L)		Sales tax (%)		Other fuels	
	Tax rate	Exemption	Tax rate	Exemption	Diesel	LPG
FEDERAL	4.9	1.4	n/a	n/a	6.4	3.6
Alabama	4.8	0.0	4.0	0.0	5.0	4.5
Alaska	2.1	0.0			2.1	
Arizona	4.8	0.0	5.6	0.0	6.9	4.8
Arkansas	5.7	0.0	5.1	0.0	6.0	4.4
California	4.8	0.0	6.0	0.0	4.8	1.6
Colorado	5.8	0.0	2.9	0.0	5.4	5.4
Connecticut	6.6	0.0	6.0	0.0	6.9	
Delaware	6.1	0.0			5.8	5.8
Dist. of Col.	5.3	0.0	5.8	0.0	5.3	5.3
Florida	3.7	0.0			7.0	7.0
Georgia	2.0	0.0	4.0	0.0	2.0	2.0
Hawaii	4.2	0.0	4.0	4.0	4.2	2.1
Idaho	6.6	0.7	5.0	0.0	6.6	4.8
Illinois	5.0	0.0	4.4	1.1	5.7	5.0
Indiana	4.8	0.8	6.0	0.0	4.2	
Iowa	5.4	0.3	5.0	0.0	5.9	5.3
Kansas	6.3	0.0	5.3	0.0	6.9	5.8
Kentucky	4.3	0.0	6.0	0.0	3.5	4.3
Louisiana	5.3	0.0	4.0	4.0	5.3	4.2
Maine	6.7	2.0	5.0	0.0	6.9	4.8
Maryland	6.2	0.0	5.0	0.0	6.4	6.2
Massachusetts	5.5	0.0	5.0	0.0	5.5	4.6
Michigan	5.0	0.0	6.0	0.0	4.0	4.0
Minnesota	5.3	0.0	6.5	0.0	5.3	4.0
Mississippi	4.9	0.0			4.9	4.5
Missouri	4.5	0.0			4.5	4.5
Montana	7.1	0.0			7.3	
Nebraska	6.5	0.0	5.5	0.0	6.5	6.5
Nevada	6.6	0.0			7.3	5.8
New Hampshire	5.2	0.0			5.2	4.8
New Jersey	2.8	0.0			3.6	1.4
New Mexico	4.9	0.0	5.0	5.0	5.2	1.6
New York	6.2	0.0	4.0	0.0	5.6	2.1
North Carolina	6.4	0.0			6.4	6.4
North Dakota	5.5	0.0	5.0	0.0	5.5	5.5
Ohio	6.9	0.0	5.0	0.0	6.9	6.9
Oklahoma	4.5	0.0	4.5	0.0	3.7	4.5
Oregon	6.3	0.0			6.3	4.9
Pennsylvania	6.8	0.0	6.0	0.0	8.1	5.1
Rhode Island	7.9	0.0			7.9	7.9
South Carolina	4.2	0.0	5.0	0.0	4.2	4.2
South Dakota	5.8	0.5	4.0	0.0	5.8	5.3
Tennessee	5.7	0.4	7.0	0.0	4.9	3.7
Texas	5.3	0.0	6.3	0.0	5.3	4.0
Utah	6.5	0.0	4.8	0.0	6.5	6.5
Vermont	5.3	0.0			6.9	
Virginia	4.6	0.0			4.2	4.2
Washington	7.4	0.0	6.5	0.0	7.4	
West Virginia	6.7	0.0			6.7	6.7
Wisconsin	7.5	0.0	5.0	0.0	7.5	7.5
Wyoming	3.7	0.0	4.0	0.0	3.7	

Biofuel obligations

Most recent policy developments in the United States stem from the Energy Policy Act of 2005, H.R. 6, which was signed into law by President G.W. Bush on August 8, 2005. This act created a nationwide renewable fuels standard (RFS) that will raise the use of biofuels (mostly bioethanol and biodiesel) to 28.4 billion L per annum by 2012, which is effectively 5% of the total fuel sales. The Act also introduced credits for the purchase or lease of flex-fuel vehicles by taxpayers, although these credits diminish as the sales of flex-fuel vehicles progress by manufacturer through the fiscal year. The 2005 Energy Policy Act has had some unintended consequences as related to biofuels, however. Section 701 of the Act requires flex-fuel vehicles in the US federal fleet to operate on alternative fuels 100% of the time. By Executive Order 13149, federal flex-fuel vehicles were previously required to operate on alternative fuels the majority of the time (i.e. 51% or more). Thus, Section 701 has effectively doubled E85 use and thus has increased the price and limited availability of E85 fuels.

Three individual states have introduced fuel use requirements. In California, the city of San Francisco has mandated that diesel vehicles used by San Francisco's public agencies must use at least a 20 percent biodiesel (B20) blend by the end of 2007, and these agencies should pursue actions to use increasingly higher blends including neat biodiesel (B100) after 2007. In Iowa, the Iowa Renewable Fuels Standard aims to replace 25% of gasoline in the state with either ethanol or biodiesel by January 1, 2020. The implementation schedule for this rises by 1% per year from 2009 (10%) to 2014 (15%), and then rises by 2% per year until 2020. One provision of the standard is to require retailers to sell a certain percentage of renewable fuels as part of their total gasoline sales. Finally, Washington has stipulated that at least 2% of the diesel sold in the state must be biodiesel as of 30 November 2008, or when a determination is made by the Director of the State Department of Ecology that feedstock grown in Washington State can satisfy a 2% fuel blend requirement. The biodiesel requirement would increase to 5% once in-state feedstocks and oil-seed crushing capacity can meet a 3% requirement. Again within Washington, all gasoline sold in the state must contain at least 2% ethanol beginning 1 December 2008, and this could be increased to 10% if the Director of Ecology determines that this would not jeopardize continued attainment of Clean Air Act standards.

Fiscal incentives and investment subsidies

Several incentive programs are supported by federal funds, including the Alcohol Fuel Credit (a corporate tax credit designated for industry producing bioethanol), deductions for both clean-fuel vehicles and refueling properties, and the Renewable Energy Systems and Energy Efficiency Improvements Program. The latter program is designed to aid in the construction of new facilities, and will cover up to 25% of construction costs. Maximum grants for a single project under this program are US \$500,000, and the fund generally pays out between US \$3-5 million in any given year.

Other measures stimulating the implementation of biofuels

The total financial commitment that the US has made to biofuels dwarfs the investment that other countries have made. By 2006, total cumulative US funding through national or state programs applicable to bioethanol has exceeded US \$2.5 billion. The largest amount of funding has been offered by the federal government. Annual program spending by all government agencies, primarily the US Department of Agriculture and the US Department of Energy, on alternative fuels exceeded US \$253 million in 1998 and has risen since to more than US \$300 million. This has resulted in improving the technology that is utilized by the industry, and has broadened the potential number of coproducts that can be generated from the bioethanol production process.

Support of R&D:

Significant funding in the US has been directed towards developing cost-effective coproducts from the biofuel production process, allowing the creation of 'biorefineries' with improved economic and environmental performance. Pilot facilities are already operating under some of these funding programs.

Promotion of second generation biofuels

The recently-announced '20/20' vision for biofuels (introduced as a Senate Bill July 29, 2005) defines a future biofuel production goal for the US as 20 billion gallons (approximately 75.7 billion

L) by 2020. As the US starch-based bioethanol capacity is already quite high, it is unlikely that continued growth could achieve this goal. Accordingly, in his State of the Union Address for 2006, the President outlined the Advanced Energy Initiative, which seeks to reduce US dependence on imported oil by accelerating the development of new, renewable alternatives to gasoline and diesel fuels. These alternatives include bioethanol and other future biofuels derived from cellulosic biomass. Cellulosic biomass is an attractive energy feedstock because it is an abundant, domestic, renewable source that can be converted to liquid transportation fuels including bioethanol, which can be used readily by current-generation vehicles and distributed through the existing transportation-fuel infrastructure. To determine feedstock availability for cellulosic bioethanol processes, the US Department of Agriculture commissioned a report which explored the technical feasibility of a billion-tonne annual supply. This report found that approximately 1.24 billion dry tonnes of cellulosic biomass can be sustainably produced each year, with about 910 million tonnes coming from agriculture and an additional 330 million tonnes from the forest sector.

US production of biofuels is significant, but today only comprises about 2.6% of liquid fuel consumption. In order to become a more significant component of the transportation fuel sector, biofuel production must grow tremendously, which will require access to cellulosic biomass. The Advanced Energy Initiative includes the Biorefinery Initiative, which sets a goal of making cellulosic bioethanol cost-competitive by 2012 and which provides significant funding to achieve this goal (\$91 million in 2006, \$150 million in 2007). Biorefining pilot facilities are already operating with starch-based feedstocks, and these processes have the potential to be applied to cellulose-based biofuel production facilities, which will contribute to the economic viability of these operations. If these measures are successful, cellulosic bioethanol production could easily become the dominant biofuel within the US.

14.4 Market development and policy effectiveness

In the United States, most bioethanol production capacity is concentrated in the Midwest, where corn is found in abundance, and where state and federal government incentives have combined to make an attractive environment for investment in the infrastructure required for bioethanol production. Over half of US production capacity is found in just three states, each of which have supplied significant capital resources to the bioethanol industry. The US states with the highest bioethanol capacities include Illinois (annual bioethanol production capacity, 5.1 billion L), Iowa (3.7 billion L), South Dakota (2.2 billion L), Minnesota (1.9 billion L) and Nebraska (1.8 billion L). Today, there are 94 ethanol plants in the United States, producing about 18.5 billion litres per year, with an additional 16 plants and 2.5 billion litres of capacity under construction.

Table 14.2 - Existing and future U.S. ethanol capacity (2006)

State	Existing plants (2006)	Under construction (2006)	Existing capacity (million litres/a)	New capacity (million litres/a)
Illinois	5	2	5,057	405
Iowa	21	3	3,723	360
South Dakota	11	4	2,165	901
Minnesota	15	2	1,899	87
Nebraska	10	1	1,800	151
Kansas	7	-	782	-
Wisconsin	5	1	719	151
Michigan	3	-	568	-
Missouri	3	-	416	-
Indiana	1	1	386	151
Colorado	3	-	322	-
Tennessee	1	-	254	-
Kentucky	2	-	145	-
New Mexico	1	-	114	-
California	2	-	114	-
North Dakota	1	1	40	189
Wyoming	1	-	19	-
Ohio	1	-	11	-
Georgia	1	-	2	-
Texas	-	1	-	114
Total	94	16	18,533	2,509

Over the past few years, biodiesel production in the US has also begun to rise, from 1.9 million litres in 1999 to 280 million litres in 2005. Biodiesel capacity is primarily found along the Northeastern seaboard, in the Mideast and Southern states, and on the West Coast.

Table 14.3 - Biofuel development and market share, USA

Production (Year)	Biodiesel (000 L/a)	Bioethanol (million L/a)	PPO (n/a)	Biogas (n/a)	2 nd -Gen (n/a)	Market share (%)
2000	7,570	6,169				
2001		6,699				
2002	56,775	8,062				
2003	75,700	10,598				
2004	94,625	12,869				
2005	283,875	14,777 ^(A)				
2006		18,376				
2007						
2008						
2009						
2010						

Source: NBB (2006), RFA (2007). *Grey italicized figures are predicted values.*

^(A) Note that this figure is lower than reported capacity in Table 13.2 above, but this is largely due to the rapid expansion of the industry during 2005.

14.5 Sources

- ▶ Evans, M.K. 1997. The economic impact of the demand for ethanol. Prepared for the Midwestern Governors' Conference, February 1997.
- ▶ RFA (2006) US Fuel Ethanol Production Capacity. Renewable Fuels Association, Washington DC, USA
- ▶ Federal Highway Administration. 2005. Department of Transport Table MF-121T (Tax rates on motor fuel - 2004. Updated November 2005) Available online at <http://wwwcf.fhwa.dot.gov/ohim/hs01/aspublished/xls/mf121t.xls>

- ▶ DSIRE (2006) Database of state incentives for renewables & efficiency. NC State University, Raleigh NC, USA
- ▶ National Biodiesel Board. 2006. Biodiesel Production Capacity. Available online at http://www.biodiesel.org/pdf_files/fueelfactsheets/production_graph_slide.pdf
- ▶ USDOE (2006) State & federal incentives and laws. Alternative Fuels Data Centre, US Department of Energy Office of Energy Efficiency and Renewable Energy, Rockville MD, USA
- ▶ Chum H (2001) Inventory of Bioenergy and Biobased Products. Strategic Partnerships Workshop, DOE National Bioenergy Centre, Lakewood CO, USA
- ▶ US Gov (2005) Energy Policy Act of 2005. Public Law 109-58, 109th Congress, Washington DC, USA
- ▶ US Gov (2000) Executive Order 13149 of April 21, 2000. President GW Bush, White House, Washington DC, USA
- ▶ US Gov (2005) 20/20 Biofuels Challenge Act of 2005. S. 1609, Washington DC, USA
- ▶ USDOE (2006) Breaking the biological barriers to cellulosic ethanol: A joint research agenda. US Department of Energy Office of Energy Efficiency and Renewable Energy & Office of Science, Rockville MD, USA
- ▶ USDA (2005) Biomass as feedstock for a bioenergy and bioproducts industry. US Department of Agriculture Agricultural Research Service, Washington DC, USA
- ▶ Renewable Fuel Association (2007). Ethanol Statistics. Available online at <http://www.ethanolrfa.org/industry/statistics/>

15 United Kingdom

15.1 Introduction

With the resources available from the North Sea the UK has been a net exporter of crude oil and gas for a number of years. In 2005 the UK became a net importer of crude oil and gas. Renewable energy is an integral part of the Government's longer-term aim of reducing CO₂ emissions by 60% by 2050. The Government has set a target of 10% of electricity supply from renewable energy by 2010 ("Renewables Obligation" on electricity suppliers). In 2004, 3.1% of the UK's electricity supply came from eligible sources of renewable energy. During the same period, 3.6% of the UK's electricity supply came from all sources of renewable energy.

15.2 Main drivers for biofuels policy

The main driver for biofuels policy in the United Kingdom is carbon reduction. In the UK the transport sector has seen a steady increase in carbon emissions whilst other sectors have been reducing their emissions.

15.3 Biofuels policy

Biofuel targets

See 'Biofuels obligation'.

Excise duty reductions

Tax reductions in for biofuels were first introduced in 2004 with a reduction for biodiesel. On the first of January 2005 a similar tax reduction was introduced for bioethanol. The tax reductions are guaranteed for three years with a review each year.

Table 15.1 - Tax reductions (€/L biofuel)

Year	Ethanol (sugar, starch)		ETBE		Biodiesel		PPO
	E85	blend			B100	Blend	100
2004					0.298	0.298	
2005	0.298	0.298			0.298	0.298	
2006	0.298	0.298			0.298	0.298	
2007	0.298	0.298			0.298	0.298	
2008	0.298	0.298			0.298	0.298	
2009	0.298	0.298			0.298	0.298	

Biofuel obligations

In the financial year the UK government will introduce a biofuels obligation (Renewable Transport Fuel Obligation, RTFO) on fuel suppliers. The obligated parties are those companies currently paying fuel duty. The targets introduced are on a % volume basis and based on total sales. The obligated companies may discharge their obligation by supplying biofuels, by trading "certificates" with companies that have over supplied or by paying a buyout fee of £0.15 per litre. The obligated companies could supply just biodiesel so long as the volume was sufficient to cover all their petrol and diesel sales.

Table 15.2 - Biofuel targets (% by volume)

Target year	Petrol	Diesel	Petrol + Diesel
2005			
2006			
2007			
2008			2.5%
2009			3.75%
2010			5.0%

Percentage by energy not included as this depends on the biofuel supplied.

Fiscal incentives

The UK Government are currently planning to introduce a system of enhanced capital allowances (ECA) which will enable investors to write off their capital invested in the first year. This system is currently under review by the UK Finance Ministry and has been submitted to the European Commission for state aid approval.

Investment subsidies

Not available.

Other measures stimulating the implementation of biofuels

Not available.

Promotion of second generation biofuels

In the longer term, the Renewable Transport Fuel Obligation (RTFO) should be able to encourage and reward the development and use of those biofuels (including cellulosic ethanol) which deliver the maximum carbon savings with the minimum environmental impact. Currently, the Government is investigating carbon reduction targets instead of volume targets for the RTFO beyond 2010/2011. The Low Carbon Transport Innovations Strategy announced in the Energy Review will also act as a spur to low carbon transport technologies.

The Ministry of Trade and Industry's Technology Programme is also supporting next generation transport biofuels and has supported the several projects to date, for example, projects by Imperial College of Science, Technology and Medicine, BLC Leather Technology Centre Ltd and TMO Biotec Ltd. The Department has also supported two Global Watch Missions on bioenergy and biofuels which have included work on next generation biofuels and been published in 2006.

15.4 Market development and policy effectiveness

Since the tax incentives were introduced in the UK during 2004 and 2005 33 million litres of biodiesel and 85 million litres of bioethanol were blended in the UK. Early in 2006 10 E85 pumps were installed in the UK by a supermarket chain, Morrisons, 5 as part of the European BEST project.

Table 15.3 - Biofuel development and market share, UK

Production (Year)	Biodiesel (000 L/a)	Bioethanol (million L)	PPO (n/a)	Biogas (n/a)	2 nd -Gen (n/a)	Market share (%)
2000						
2001						
2002	3,528					
2003	10,584					
2004	10,584 ^(A)	85 ^(B)				
2005	59,976 ^(A)	85 ^(B)				
2006						
2007						
2008						
2009						
2010						

Source: EBB (2006), *Grey italicized figures are predicted values.*

^(A) Note that these are reported production figures; 33 million litres of biodiesel were reported as being blended in 2004 and 2005.

^(B) 85 million litres of ethanol were reported as being blended in 2004 and 2005.

15.5 Sources

- ▶ www.dti.gov.uk/energy/sources/renewables/index.html
- ▶ www.dft.gov.uk/stellent/groups/dft_roads/documents/page/dft_roads_611908-02.hcsp
- ▶ www.uktradeinfo.com/index.cfm?task=bullhydro
- ▶ European Biodiesel Board. 2006. Statistics - The EU Biodiesel Industry. Available online at <http://www.ebb-eu.org/stats.php>