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BIODIESEL CHAINS

Promoting favourable conditions to establish biodiesel market actions

Emerging best practice

D 11. Case studies
D12. Best practice report
D 13. Success factors and barriers

Case studies: Germany, Austria, Poland, France, United Kingdom

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Intelligent Energy Europe

Biodiesel Chains:

Promoting favourable conditions to establish biodiesel market actions

WP 3 ”Emerging best practice“

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Content

1 Goal and scope

The goal of this work package is to collate information on emerging best practices and commercialisation of biodiesel in leading European Member States and understand how this can be adapted and transferred to participating countries.

Expected results

The expected results include case studies, reviews of best practice and a report on key success and failure factors that provide valuable information to the project team and the market actor networks.

2 Task descriptions

In order to reach the goal and scope of work package, the following steps are conducted:

Task 3.1: Case studies

The most relevant and promising case studies for successful application of biodiesel in EU25 countries are summarised and documented in a common format. The focus is on full supply chains including distribution networks for the biofuel. Five case studies are produced. These are done using published material and by arranging visits and holding interviews and meetings.

Task 3.2: Best practice
According to the case studies, the project partners collect and present examples of best practice within the biofuel sector. Best practice is considered with reference to technical, economic, environmental performance, innovation, fit with communities etc.

Task 3.3: Key success factors and barriers

In parallel to the above tasks, factors that are most important to the success of biodiesel market chain development are identified. Additionally, information is collected relating to important factors that had a negative influence on project development, undermining or preventing success of projects. These factors are analysed and reviewed.

Deliverable 11
Case studies

3 Case studies

This chapter documents case studies on the development of biofuels and the current status of biofuel use in five different countries. A focus of these case studies is on the main barriers and drivers for the use of biofuels.

As case studies

- Germany,
- Austria,
- France,
- the United Kingdom and
- Poland

have been selected. Of these countries Austria and Germany have a particularly long history of biodiesel production. Also in France and the UK, biodiesel is already established, though to a lesser degree. These countries are therefore believed to allow for a good identification of the main drivers and barriers to the successful application of biodiesel. Finally, Poland has been selected as a country in which biodiesel use began at a later stage and will thus provide more detailed insight information of drivers and barriers for the introduction of biodiesel in the new EU Member States.

3.1 Germany

3.1.1 Development of biodiesel in Germany

Biodiesel use in Germany started as a niche market and in the beginning was not noticed very much by the German public. Eventually, Germany grew to be the biggest biodiesel producer and consumer worldwide; in 2006, approx. 2.5 million tonnes of biodiesel were consumed [BMF 2007]. Nevertheless, during the past 15 years, several barriers have been challenging the stakeholders.

In the mid 1990's, biodiesel faced considerable acceptance problems both in the general public and with biodiesel users. This was due to different reasons, the most influential one being that this biofuel had been and was leading to numerous vehicle breakdowns due to

a) biodiesel usage in non-approved engines or drive concepts and

b) varying biodiesel qualities.

Furthermore, different interpretations of life cycle assessments and economic analyses caused major insecurities.

To overcome these obstacles, various measures, activities, initiatives, programmes and incentives have been implemented since then. Different competent stakeholders have been striving for joint actions in order to find effective solutions. These actions have had various consequences such as the definition of a fuel norm and a quality assurance system, which paved the way to a further increase of biodiesel usage.

As early as 1994, the first preliminary German norm for biodiesel produced from plant oils was established by the German Institute for Standardisation: DIN V 51606. This norm was improved and refined in the following years and published in a second draft version, DIN E 51606, in September 1997. It defined biodiesel as fatty-acid methyl ester (FAME) [ÖBI 2002]. It still had the status of a draft standard, but was fully valid and set the technical basis for almost all approvals for biodiesel by the automobile industry [AGQM 2004].

In November 2003, the European norm EN 14214 [CEN 2003] was published in Germany as DIN EN 14214 [DIN 2003] and replaced the previous German standard for biodiesel. Regarding several parameters, the new norm is stricter than the previous one and it contains additional requirements. It represents the technical basis of the renewed fuel quality and labelling regulation (10th Adaptation of the Federal Immission Regulation, 10. BImSchV) for biodiesel [BImSchV 2004]. According to this regulation, biodiesel may be sold as a fuel only according to the parameters of DIN EN 14214. Biodiesel pumps must be labelled explicitly to show that the biofuel sold complies with the current norm.

In addition to this official norm, an organisation exists in Germany which strives for standardisation, namely the ‘Arbeitsgemeinschaft Qualitätsmanagement Biodiesel e.V.’ (AGQM, Association for the Quality Management of Biodiesel). It was founded in November 1999 on initiative of the UFOP (Union for the Promotion of Oil and Protein Plants, Berlin). This was a time when – due to increased numbers of biodiesel producers and trading enterprises – the necessity of organised quality protection became clear. The members of AGQM are manufacturers, biodiesel traders, filling station societies as well as further prospective customers, for example manufacturers of additives and constructors.

With the development of solutions for the technical problems, quality management and public acceptance have improved. This has led to a considerable increase in biodiesel consumption, especially after 1999 (see Fig. 3-1).

After a time of intensive financial support for biofuels, the framework conditions changed considerably in 2006 and 2007, especially for biodiesel. In spite of this (slightly less favourable) new situation, the production capacity and consumption have both continued to increase.

3.1.2 Current situation of biodiesel in Germany

In 2006, the biodiesel production capacity in terms of refineries was over 3.5 million tonnes and estimations for 2007 amount to 5 million tonnes [UFOP 2007 and BMF 2007].

Biodiesel imports from 2006 to mid 2007 originated both from other European countries – mostly from the Czech Republic, Poland, France, Italy and Denmark – and from the United States of America (mainly soy-based) [BMF 2007].

The biodiesel consumption in Germany in 2006 amounted to about 2.5 million tonnes of biodiesel [UFOP 2007 and BMF 2007].and the trend of an increasing consumption is estimated to continue, even though the gradient will probably be smaller (see Fig. 3-1). The shares of different sectors read as follows [AGQM 2007]: heavy-duty vehicle fleets still dominate the biodiesel consumption with a 50% share of the total amount distributed via company-run as well as public filling stations. Private consumption (from public filling stations) accounted for 6%, thus having decreased by more than half compared to the previous year. 40.4% was used for blending, which already represents a clear increase versus 2005; this trend is expected to continue. The remaining 3.6% of the consumed biodiesel was used in agriculture.

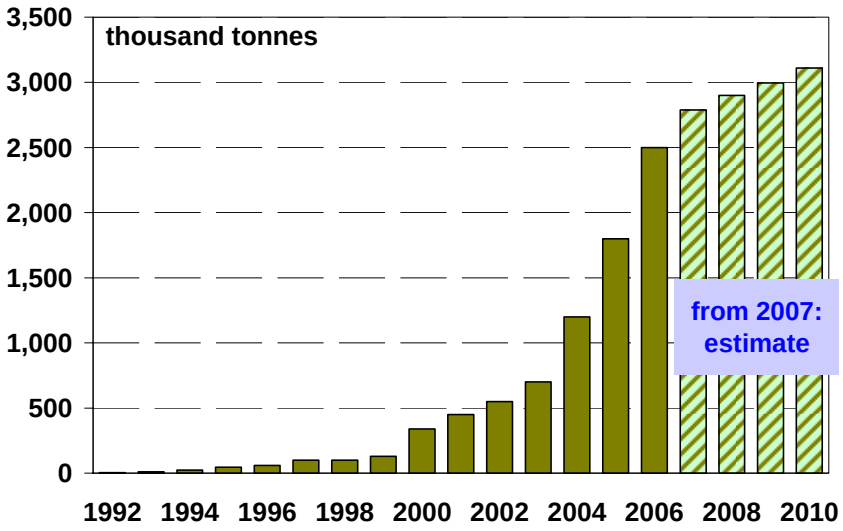

Fig. 3-1 Biodiesel consumption in Germany between 1992 and 2010 (Source: IFEU 2007)

About 1,900 filling stations (nearly 13% of all public filling stations) currently offer biodiesel in Germany. About 1,300 of these stations offer AGQM-approved biodiesel; this number has hardly changed in the past 2 years. Fig. 3-2 shows the distribution of AGQM filling stations in 2004 with the main distribution centres North-Rhine Westphalia, Lower Saxony and Bavaria.

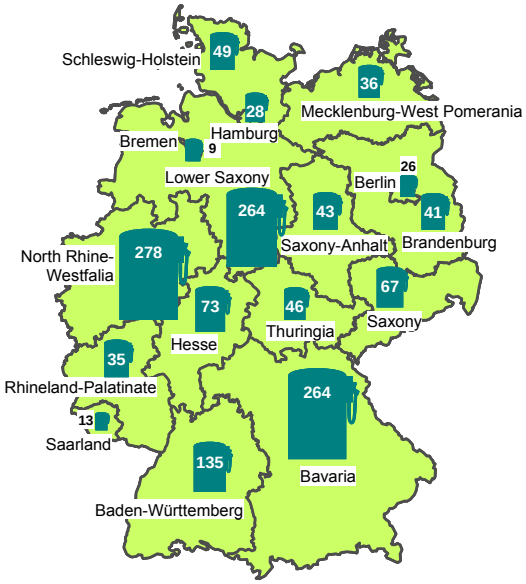

Fig. 3-2 German filling stations offering AGQM-approved biodiesel (Source: Bockey 2004)

Until August 2006, the tax exemption for all transport biofuels was certainly the most important incentive for these, including biodiesel. Furthermore, in 1999 a step-by-step increase of the mineral oil tax was introduced among other things by the so-called ecological tax reform (Ökologische Steuerreform) with the declared aim to increase the cost of fuel consumption and thus make the population drive less – or more economically. Indirectly, this tax increase can also be seen as a small incentive for alternative fuels which grew more competitive.

The tax exemption was an important cost factor especially for companies, which also explains the high share of fleets among the biodiesel consumers. On the other hand, great costs for society (in the form of taxation revenue loss) resulted from this promotion measure. These costs to society, i.e. tax payers, were difficult to defend, since there are other more cost-effective options to reduce carbon dioxide emissions (see Table 3-1).

Table 3-1 Funding efficiency of measures for reducing CO_2 emissions

Field of measures	**Costs (funding efficiency)** (in € per tonne saved CO_2)
Driving manner	6 €/t
Pellet heating	8 €/t
Zero energy houses	12 €/t
Vehicles	38 €/t
Refrigerators	100 €/t
Biofuels for transportation	200 €/t
Photovoltaic	500-1000 €/t
	Source: IFEU 2006

Therefore, a dual strategy for biofuels was designed. In June 2006, the German Parliament decided on a step-by-step increase of the taxation of pure biodiesel, biodiesel blends and plant oil [Federal Government 2006a]. This regulation became effective nation-wide on

August 1st, 2006 (see Table 3-2). For the time being, other biofuels will remain tax-free. This tax exemption, however, is only valid up to the limit of overcompensation.

Table 3-2 Taxation of biofuels in Germany (state: August 2006)

Biofuel	Taxation	Time period
Pure biodiesel	0.07 €/l	Aug. 1, 2006 – 2007
	0.13 €/l	in 2008
	0.20 €/l	in 2009
	0.26 €/l	in 2010
	0.32 €/l	in 2011
	0.45 €/l	in 2012
Biodiesel in blends	0.15 €/l	until Dec. 31, 2006
	0.4704 €/l	from 2007
Pure plant oil	0 €/l	in 2006 & 2007
	0.08 €/l	in 2008
	0.17 €/l	in 2009
	0.25 €/l	in 2010
	0.32 €/l	in 2011
	0.45 €/l	in 2012
Ethanol/ ETBE	tax exemption	
All biofuels used in agriculture & forestry	tax exemption	

Source: Federal Government 2006a

Furthermore, since January 1st, 2007, any party putting fuel(s) in circulation is obliged to ensure that a certain (minimum) amount of biofuels is also put in circulation [Federal Government 2006b]. While for gasoline, this quota (e.g. for bioethanol) is to gradually increase in several yearly steps, the diesel quota was set at a 4.4% biofuel (e.g. biodiesel) volume share of the diesel fuel from the beginning. From 2009 on, a “total quota” will become effective. Non-compliance to these requirements results in high fines, e.g. 60 Eurocent per litre in the case of the biodiesel quota. Table 3-3 gives an overview of the taxation scheme.

Table 3-3 Quotas for diesel fuel and gasoline defining the compulsory biofuel shares which must be ensured by any party bringing fuels into circulation (in % of fuel energy value)

Year	Diesel quota (e.g. biodiesel share)	Gasoline quota (e.g. bioethanol share)	Total quota
2007	4.4%	1.2%	–
2008	valid for following years	2.0%	–
2009		2.8%	6.25%
2010		3.6%	6.75%
2011		valid for following years	7.00%
2012			7.25%
2013			7.50%
2014			7.75%
2015			8.00%

Source: Federal Government 2006b

But even after the tax exemption for biofuels has partially been replaced by mere tax relief regulations, the national economy is indirectly funding the use of biofuels with large sums. Fig. 3-3 illustrates how the step-by-step increase of biodiesel taxation (see Table 3-2) is helping to reduce tax revenue losses.

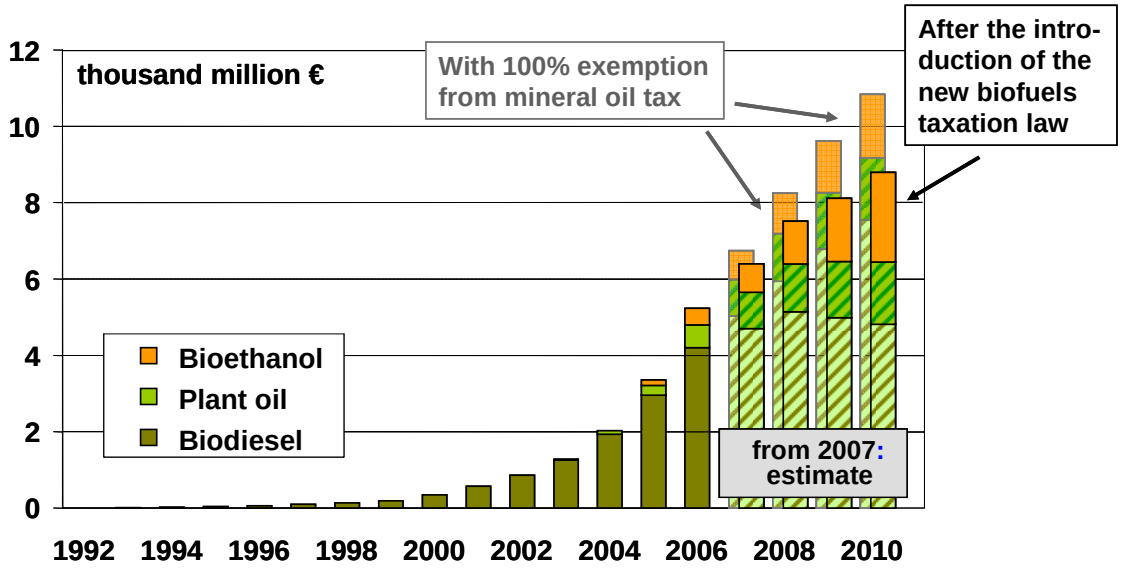

Fig. 3-3 Cumulated revenue loss from biofuel tax relief 1992-2006 illustrating the effect of the law on the taxation of biofuels; estimations for 2007-2010 (Source: IFEU 2007)

As this report is being finalised, the German government is considering possibly suspending the tax raise of 6 Eurocent on pure biodiesel planned for January 2008 due to the widespread concern in the sector that this tax increase could substantially hurt small and medium-sized producers [DLZ 2007].

Several other issues must be mentioned in connection with the current situation of biodiesel in Germany; some of these are actual “problems” while others illustrate discussions around biofuels at the end of 2007. In the following, these issues are briefly addressed.

- Around the time when biodiesel was first being taxed (again), production plants began closing down and reports of a “biodiesel crisis” increasingly made the news [BBK 2007]. Blamed primarily on the end of tax exemption, thus on the interference of the State, this development had more than just this one reason. As in other countries, raw materials, i.e. oil seeds, were not as plentiful and marketed at higher prices. Imports from overseas which were specifically subsidised by the producing country further disrupted the European and especially the German biodiesel market, the most prominent example being soy bean biodiesel from the USA [UFOP 2007]. Furthermore, after a wave of optimistic investments into and consequently expansion of biodiesel production, the competition was now beginning to regulate the activities of this sector.
- Due to the introduction of the Euro 5 standard [EC 2007] for motor vehicle emission limits, new diesel-fuelled vehicles will not be approved to run on pure biodiesel since the filters in the cars (designed to fulfil the standard’s specifications) do not perform well with biodiesel. In other words, car manufacturers are denying any warranty if biodiesel is

used. To date, a technical solution to this problem has not been found and neither can it be expected anytime soon. Therefore, biodiesel consumption will presumably decrease in modern vehicles.

- Domestic raw materials can only generate 2 million tonnes of biodiesel per year, which is more or less equivalent to the amount necessary to fulfil the diesel quota (see Table 3-3) and thus largely insufficient to cover the entire demand for pure plant oil biofuel and biodiesel [BMF 2007]. Therefore, the main share of raw materials and/or biofuels will have to be imported in the future.
- Apart from the use as biofuels in transport vehicles, biomass is also increasingly used for the production of electricity and heat in stationary plants. Thus an increasing demand for biomass raw materials for different purposes is also leading to a competition with other sectors over biomass.
- The increasing shortage of land for the production of biomass equally creates a competition situation regarding other uses and aims. Sustainability targets such as water protection, soil conservation, nature conservation, organic farming and compensation areas increasingly demand land which then can not be used for the cultivation of biomass.
- As is currently happening in other European countries as well as at the EU level, the topic of biofuel sustainability has become a central issue both in scientific research and on a political level. The Federal Government has initiated a legislative procedure regarding the introduction of (mandatory) sustainability criteria for imported raw materials and biofuels as well as their use [IFEU et al. 2007]; first decisions are expected in December 2007.
- The public and scientific discussion over biofuels, notably biodiesel, is currently very strongly determined by yet another environment-related issue. In August 2007, a study was published which denies biodiesel from rapeseed (and bioethanol from corn) a general great potential of saving greenhouse gases [Crutzen et al. 2007], i.e. the potential of contributing to the fight against global warming. This characteristic, which up to then had largely been regarded as a given fact and commonly stated as one of the main reasons for promoting this biofuel, was now thoroughly questioned. Other studies had previously come to critical conclusions, but this publication made an especially strong impact on the discussion and offensive media coverage questioning the “usefulness” of biofuels increased abruptly in the fall of the same year. Together with reports on the damage done to natural (or otherwise valuable) ecosystems in other parts of the world, especially in the tropics, for the sake of producing biofuels, the consequence is a growing pressure on policy-makers. The call to reduce direct subventions and indirect financial benefits, e.g. tax reductions, for biodiesel and biofuels in general is becoming louder – and increasingly coming from “green” groups of society as well.

3.1.3 Drivers and barriers for biodiesel in Germany

Barriers

The barriers for biodiesel in Germany have changed over time. During the initial introduction phase of biofuels in the transport sector, the main problems were technical issues such as biofuel quality and availability as well as the operability of approved vehicles. These issues must be solved in order to enable a common acceptance and to increase biofuel use. Today, after a firm establishment of biofuels on the market, they are generally still perceived as more environment-friendly than their fossil equivalents. The term “Bio-Diesel”, for example, carrying the same prefix as other “Bio” products which are commonly from organic agriculture, even causes many people to believe the fuel is a fully sustainable product. However it has been shown that besides their advantages, biofuels also have environmental disadvantages. The legislative framework must therefore be adapted to this ambivalent status in order for public acceptance to be secured in the future.

Although tax exemptions initially were a main driver to increase biofuel consumption in Germany, they are now gradually being reduced after having been strongly debated in terms of the costs to society, especially with CO_2 avoidance costs being comparatively high. The current legislation must be reviewed every year with special regard to the impact on the biodiesel market as well as possible overcompensation. An increasing competition for both land (due to other sustainability targets) as well as for biomass (due to use in stationary plants) have also been identified as barriers to further biofuel production and use in Germany.

Drivers

The solution to technical problems of biodiesel use (number and operability of approved vehicles) and the standardisation and monitoring of this biofuel’s quality were prerequisites for its acceptance and consumption. Marketing campaigns (e.g. by UFOP) further increased the perception of biofuels as environment-friendly and convinced fleet owners of the operability. Lobbying is therefore a real driver for the acceptance and use of biofuels in Germany.

Apart from these main prerequisites, the initial tax exemption, the following tax relief and quotas for biofuels have been the main drivers for the biofuel consumption in Germany. Especially for fleet owners, fuel costs are an important issue. Using biofuels will be seriously considered if these are available and reliable while resulting in an economic benefit. The perception of biofuels as being environment-friendly can also be used in marketing campaigns of the fleet owner and may influence private consumers positively.

Table 3-4 Summary of barriers and drivers for biodiesel in Germany over time

Barriers	Drivers
Poor biofuel quality (esp. at initial stage in the 1990's)	Biofuel quality standardisation and monitoring*
Technical operability (approved vehicles)	Environment-friendly image
Environmental disadvantages (life cycle analyses)	Tax exemption or relief for biofuels
High costs to society due to tax exemptions	Fuel quota legislation
Competition for land due to other sustainability targets	Marketing campaigns (e.g. UFOP), lobbying
Competition for biomass due to stationary use	

* Rather than being a real driver, quality control is a measure taken to overcome the poor quality barrier.

3.2 Austria

3.2.1 Development of biodiesel in Austria

The mineral oil crisis of the early 1970's triggered initiatives in Austria to search for potential alternative fuel supply opportunities from renewable sources. The focus of these initiatives has been on the development of rapeseed-oil-methyl-ester for the diesel engine. Thus the independency from oil, rather than environmental concerns has been a main driver for the development of biodiesel in Austria. A basic R&D programme was started by the Federal Institute for Agriculture Engineering (BLT) as early as 1973. A pilot plant with a 700-litre capacity was established in 1982 and in 1990, the first industrial plant was started in Aschach with a capacity of 10,000 tonnes. After years of stagnation between 1993 and 2000, the biodiesel production capacity in Austria has increased considerably since 2001 (see Fig. 3-4).

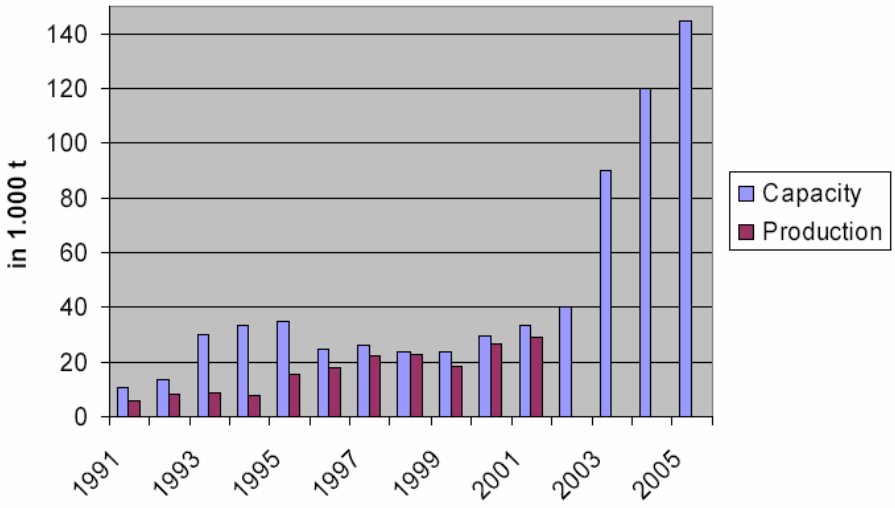

Fig. 3-4 Biodiesel capacity and real production in Austria (Source: SenterNovem 2004)

The introduction of fuel quality standards has been an important prerequisite for the production and consumption of biodiesel. Therefore, as early as 1991, Austria defined the first standards and test methods for biodiesel worldwide with the ÖNORM C 1190. In 1997, the ON C 1191 also defined standards for fatty acid methyl esters (FAME). This standard, together with the DIN 51606, was the basis for the European standard EN 14214 [CEN 2003] which became effective in 2004. The EN 14214 today is "*the most advanced biodiesel fuel standard as the required basis for quality control, customer confidence and market acceptance*" [Schober & Mittelbach 2005].

Despite the high production capacity and also considerable production volumes, biodiesel consumption in Austria is still limited. One reason is that for several years, a large share of the produced biodiesel was sold to neighbouring countries; in 2005 this share amounted to 90% [Federal Government 2007c]. The fact that the prices which could be obtained for biodiesel in Italy and Germany were higher than in Austria enforced this trend which in turn lead to limited remaining sales and shrinking product publicity in Austria itself.

To support biodiesel consumption, the Austrian government exempted biodiesel from the mineral oil tax at an early stage. Since the start of commercial biodiesel production in Austria, usage of 100% biodiesel has been fully exempt from mineral oil taxation. In 1999, blends of up to 3% biodiesel were also exempt from taxation. Since October 1st, 2005, a special tax reduction is granted to biodiesel blends containing less than 10ppm of sulphur and a minimum share of 4.4% biodiesel [Federal Government 2007a]. This tax reduction is valid to date, even if the general excise duty (mineral oil tax) on diesel fuel – including this so-called "Diesel Bio Plus" blend – was raised by 5 Eurocent per litre as of July 1st, 2007 [Federal Government 2007b].

3.2.2 Current situation of biodiesel in Austria

Due to the rather limited acreage for the cultivation of rapeseed, the supply from Austrian farmers to local oil mills remains limited and feedstock availability is therefore insufficient. "*This is in obvious contrast to Germany, where the rapeseed acreage and the yields were continuously increased by systematic application of promotion, training and education as organised by […] UFOP, through which the so far neglected rapeseed cultivation became a recognised parts for the farmers' income*" [SenterNovem 2004].

Several small- to industrial-scale plants for biodiesel production are currently operating in Austria. Fig. 3-5 gives an overview of the situation in 2004/2005; the total production capacity in 2006 was approximately 199,000 tonnes, however, the actual production (by seven producers) is reported to have been slightly above 121,000 tonnes. Taking into account further extensions "*within the next year a total biodiesel production capacity of over 340,000 t could be reached"* [Schober & Mittelbach 2005]. This estimation for 2006 is similar to a more recent one made for 2007, however: biofuel producers themselves [ABÖ 2007] predict a total production capacity of 351,000 for 2007. The Ministry of the Environment estimates on 440,000 tonnes Austrian biodiesel production capacity in 2007 [Federal Government 2007c].

Despite the high production capacity and also considerable production volumes, biodiesel consumption in Austria has remained limited. While in 2005 90% of the produced biodiesel

was sold to neighbouring countries, the exported share in 2006 was merely 10%. Total biodiesel sales in 2006 are reported to have amounted to 321,000 tonnes, 94% of which was used for blending [Federal Government 2007c]. This means that biodiesel imports also play a role in Austria.

In light of the EU biofuels Directive (2003/30/EC) which aims at achieving market shares of 5.75% by 2010, the Austrian Government has implemented a substitution requirement. This revision of the Fuels Decree requires a proportion of 2.5% of the energy content to be covered by biofuels or other renewable fuels, calculated on the basis of the total energy content of the gasoline and diesel fuel placed on the market in the transport sector each year starting in October 2005 [Federal Government 2004]. This proportion increased to 4.3% in October 2007 and shall be raised to 5.75% in October 2008.

Fig. 3-5 Biodiesel production capacity in Austria (Source: Schober & Mittelbach 2005)

3.2.3 Drivers and barriers for biodiesel in Austria

Barriers

Just as in Germany, the main barriers to the introduction of biofuels in the transport sector initially were technical issues such as the quality of biofuels and availability and operability of approved vehicles. These issues need to be solved to achieve a general acceptance and increasing use of biofuels.

The fact that tax exemptions in Germany and Italy were even higher than in Austria, has been a barrier for the biofuel consumption in Austria; A large share of the fuel produced in

Austria is still exported. The limited land availability for rapeseed cultivation in Austria is a barrier for feedstock production.

Drivers

The independency from fossil oil was an initial driver for the development of biodiesel in Austria. Furthermore, just as in Germany, the solution to technical problems related to biodiesel use (number and operability of approved vehicles) and standardisation as well as monitoring of the biofuel quality are prerequisites and, once achieved, important drivers for biofuel acceptance and thus consumption. Austria was the first country worldwide to define such standards and test methods for biodiesel.

Apart from these main prerequisites, the tax exemption for biofuels in Austria has been the main driver for biofuel production and consumption and the continuing tax relief is expected to act in a similar way. When tax exemptions in Germany and Italy were even higher than in Austria, tax exemptions as a promotion measure were not sufficient anymore to reach the energy substitution targets defined in the EU biofuels Directive. Therefore, a national substitution requirement was implemented in 2005 which will be an important driver for biodiesel in the years to come.

Table 3-5 Summary of barriers and drivers for biodiesel in Austria

Barriers	Drivers
Poor biofuel quality	Biofuel quality standardisation and monitoring
Technical operability (approved vehicles)	Tax exemption for biofuels
Export of biofuels to countries with higher tax exemptions (Italy and Germany)	Substitution requirement
Limited acreage for rapeseed cultivation	

3.3 Poland

3.3.1 Development of biodiesel in Poland

The history of Polish rapeseed fuel began in the 1990's with the development of a first production process (including testing periods) at Radom Engineering University. Between 1993 and 1997, different institutes as well as the Polish Armed Forces conducted research in this area, focussing on the use of various Polish and imported fuels in different vehicles.

In 1998, the Industrial Institute of Agricultural Engineering (PIMR) in Poznań (which had previously built and tested a small-scale rapeseed-fed tractor fuel production installation known as "agro-refinery" and producing diesel oil for processing plants) developed complete design documentation of a rapeseed fuel installation with a capacity of 400 litres (approx. 0.35 tonnes of rapeseed biodiesel) per day. Estimations of the costs of the installation stayed below 10,000 Euro in small lot production conditions.

3.3.2 Drivers and barriers for biodiesel in Poland

According to EU legislation applicable to Poland, farmers who invest in the production of biomass for fuel purposes receive uniform direct subsidies per hectare of farmland (SAPS – simplified single area payment scheme) maintained in good agricultural condition. These payments are made by the Agency for Restructuring and Modernisation of Agriculture (Agencja Restrukturyzacji i Modernizacji Rolnictwa, ARiMR); in 2005 the rate was PLN 225 (approx. 56 Euro) per hectare.

According to the latest law on excise duty exemptions (the Act of May 11, 2007) [PLG 2007a] approved by the President, an additional support for farmers of PLN 176 (approx. Euro 45 Euro) per hectare is to be granted for those signing the long term contracts to supply feedstock to biofuel producers. The law also imposes penalty for not adding biocomponents for fuels.

The main legal act which regulates the production of biofuels is the Act of August 25, 2006 on biocomponents and liquid biofuels [PLG 2006]. It is completed by several regulations of different Ministers:

- Regulation of the Minister of Finance of April 26, 2004 on excise duty exemption [PMF 2004]
- Regulation of the Minister of Agriculture and Rural Development of January 6, 2004 on issuing of biocomponents quality certificates [PMA 2004]
- Regulation of the Minister of Economy, Labour and Social Policy of March 19, 2004 on quality requirements for biocomponents – bioethanol and quality examination methods for biocomponents – bioethanol [PME 2004b]
- Regulation of the Minister of Economy, Labour and Social Policy of March 10, 2004 on labelling gasoline pumps for liquid biofuel sale [PME 2004a]
- Regulation of the Minister of Economy of January 22, 2007 quality requirements for biocomponents used in chosen fleet and production of biofuels by farmers for their own use [PME 2007b]

The new principles of the biofuel policy and biofuel market regulation are included in Act of July 21, 2006 on biocomponents and liquid biofuels [PLG 2006] which was adopted by Polish Parliament. It came into force from January 1, 2007. This act introduces the obligation to add ethanol or rapeseed oil ethyl esters to each litre of liquid fuel in accordance with national indicative targets. It is assumed that in the future each litre of fuel will contain from 4% to 5% of biocomponents. The definition of biofuels provided in this legislation includes any fuel with a biocomponent of over 5%. Previously, the Polish legislation only authorised a maximum of 5% biocomponents in fuels. The major biocomponents listed in the new legislation are: esters, ethanol and methanol. As “real to reach”, government defined the community requirement of 5.75% share of biofuels in the fuel market (calculated on the basis of energy content) by 2010. It also stipulates that biofuels may only be sold from separate, appropriately marked pumps. Biocomponents production, storage and introduction into the market will be registered with the President of Agricultural Market Agency.

An important part of the Act *on biocomponents and liquid biofuels* is dealing with simplified procedures allowing the production of biofuels by farmers for their own use. As from January 1st 2007, farmers are allowed to produce biofuels for their own use at up to 100 litres per hectare of agricultural land, without having to pay the VAT on these products. However, they will not be allowed to sell their own biodiesel on the market.

The prospects for biofuels depend on many factors, such as development of other alternative fuels, agricultural policy, social advantages, price, and improvement of rapeseed ester properties. The form in which the fuel will be used (rapeseed oil esters, rapeseed oil blends in diesel oil, emulsions of esters in diesel oil or refinery-cracked oil) may be of great importance. Production processes will have to be modified to improve some of the properties of biodiesel, e.g. decrease viscosity, improve low-temperature performance and stability during storage or decrease the number of sediment-forming components. Efficient and quick methods of process and product quality control need to be developed.

A decision to enter the biofuel sector should be based on the knowledge of current regulations as well as the trends in the relevant legislation.

Development of the biofuel market is one of the strategic goals of the European Union energy policy. This will be of relevance to the development of this sector in Poland. Biofuels may prove to be profitable both for farmers producing biomass and firms processing biomass into liquid fuel components and biofuels. Regulations on the import of feedstock supplies from third countries will also be of importance.

Crop production for fuel purposes and the first stage of processing towards biofuels may be supported within the framework of existing agricultural programmes. Financial support mechanisms for the modernisation and construction of biocomponent installations are to be introduced within the framework of the National Development.

All those concerned agree that there are no economic barriers limiting the expansion of biocomponents on the liquid fuel market, as regulations on excise duty rates and duty exemptions and reductions have been kept in place and modified as required. What worries potential investors is the lack of legal guarantees that the reductions and exemptions will be maintained in the long term, even though they have already been in place for more than a decade. The existing three-threshold solution promotes higher proportions of biocomponents in liquid fuels (particularly blends with a biocomponent content of more than 10%) and its attractiveness increased after the recent rise in oil prices. The companies adding biocomponents to liquid fuels are eligible for excise duty reduction calculated per litre of biocomponent, the rate depending on the percentage of biocomponents in liquid fuels, i.e. diesel fuel containing more than 2% of biocomponents – in the amount of PLN 1.048 (approx. 0.28 Euro) per litre of biocomponents added to these fuels [PLG 2007a].

Pure biodiesel (B 100) – the final excise duty on B100 has been reduced to PLN 10/m^3 (approx. 2,65 Euro/m^3), instead of PLN 202/m^3. B100 is also exempted from the additional road tax that is imposed on regular diesel, which was not the case in the previous version of the excise duty law [PLG 2007a].

On September 23, 2007 a new Act introducing an additional concession for producers of biocomponents was adopted [PLG 2007b]. The aim is to partly compensate the increased

production costs of biodiesel. Producers would be able to subtract 19% of the difference between biofuel production costs and the costs involved in the manufacturing process of fuels with similar characteristics. The allowance will cover income gained from the beginning of 2007 and will be in force until 2014. This new provision still needs to receive EC Commission DG Competition approval In July, the Polish Ministry of Finance calculated that producing biodiesel is about PLN 1.5 (0.40 Euro) more expensive than regular diesel. The aim of the new law is precisely to reduce this difference.

"The Long-Term Program Of Promotion The Biofuels or Other Renewable Fuels for 2008-2014"

The first policy for biofuel in Poland is "The Long-Term Program Of Promotion The Biofuels or Other Renewable Fuels for 2008-2014" [PME 2007a]. This document was adopted on July 24, 2007. Poland's rates of biofuels use are set as listed in Table 3-6.

Table 3-6 National targets for biofuels use – share based on energy content

Year	Share based on energy content
2007	2.30%
2008	3.45%
2009	4.60%
2010	5.75%
2011	6.20%
2012	6.65%
2013	7.10%
2014	7.55%

Source: PME 2007a

The Long-term Program for Promotion of Biofuels or Other Renewable Fuels for 2008-2014 is focused on use of biofuels and increasing demand for biofuels. Some of the premises of this document are: parking charge exemption for cars using biofuels, creation of limited areas in cities opening only for public buses using biofuels, as well as environmental tax exemptions for enterprises using cars and other vehicle, and machinery using biofuels.

The mandatory targets for biofuel in energy content were established by the Polish Government in June 2007 for the next six years [PLG 2007 c]. The mandatory national targets will be as follow:

2008: 3,45%

2009: 4,60%

2010: 5,75%

2011: 6,20%

2012: 6,65%

2013: 7,10%

The producers are right when they say there is no demand for biocomponents. On the other hand, the opinion that fuel and biofuel producers and distributors do not exhibit market behaviour is probably a simplification. The above assessment was based on an analysis of existing regulations and their interpretation and on their ultimate impact in the form of the share of biocomponents in the liquid fuel market.

The lack of clear legislation prevents trade in biofuels and rules out investment decisions. Banks treat investments in the construction of agro-refineries (ester installations) as high risk investments. As a result, the process of building adequate feedstock supply capacity is delayed, and if the assumption that the fuel market will eventually need about 700,000 to 1 million tonnes of esters per year (this is equivalent to an annual demand for 2-3 million tonnes of rapeseed) is true, then reaching this capacity may take more than ten years. According to many experts, the supply of raw materials for the production of bioethanol in Poland is sufficient and the existing bioethanol production capacity can exceed the future (2010) national demand for renewable fuels created by Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport. Production and/or storage of biocomponents are an activity governed by the Act of July 2, 2004 on the freedom of economic activity and as such require registration in the register of entrepreneurs producing or storing biocomponents. Registration is based on trust in the potential biocomponents producer, who submits an application containing basic company information as well as a declaration on the place of production and the type and quantity of biocomponents to be produced. Production of biocomponents involves handling of ethyl alcohol (on which excise duty is charged when it is intended for non-fuel purposes) or methyl alcohol (highly toxic) and fuels; therefore, the production and distribution of these products is subject to special fiscal monitoring.

Assuming that the area of energy crops in Poland is 3 million hectares – of which 1.5 million hectares is rapeseed cultivation area and 1.5 million hectares produce other energy crops – we can make a forecast of biofuels share in energy balance of Poland.

Table 3-7 Biofuels share in energy balance of Poland

Materials	Destination	Products
Rapeseed – 1.5 million hectares (possible area of cultivation) give 3 millions tonnes of material (with assumed capacity of 2 t/ha)	Fat factory – 1 million tonnes of rapeseed	Cooking oil, etc. – around 350,000 tonnes
	Biodiesel – 1.5 million tonnes of rapeseed	Biodiesel – around 525,000 tonnes of esters
	Oleochemical industry – 0.5 million tonnes of rapeseed	
Waste fat – 70,000 tonnes		Esters – 49,000 tonnes
Total		574,000 tonnes of biodiesel as esters

Source: KAPE 2007

So far, 16 entrepreneurs producing and storing esters (including two entrepreneurs who only store esters) have been registered. In total, they have declared the capacity to produce 200,000 tonnes of esters per year.

The first registered biodiesel production installation was built in Trzebinia Refinery (PKN Orlen Group), and its process start-up took place in December 2004. Its annual production

capacity is 100,000 tonnes (113.6 million litres) of rapeseed oil methyl esters and may be increased. In late 2005, Kompania Spirytusowa Wratislavia Polmos S.A. in Wrocław approved the process design of an installation for producing 150,000 tonnes of higher fatty acid esters per year.

Also much more enterprises are planning to start production of esters on the large scale.

Fulfilment of the international obligations described above urgently requires brave decisions capable of changing the attitude towards renewable fuels and measures showing that biofuels are safe and cost-effective. The prices of liquid fuels containing “bio” additives should be lower than those of so-called standard fuels. Such an approach would be justified by the fact that public support in the form of tax breaks is granted for the production of biofuels and that their energy content is lower. A package of measures required for the mobilisation of the existing renewable transport fuels potential should be developed in the context of the work on an emergency plan for the oil market and should include the following:

a) fast-tracking the drafting and implementation of the missing regulations of the Minister of Economy and Labour concerning the quality of, and quality control methods for, esters as well as gasoline and diesel oils containing over 5% and over 20% biocomponents, respectively;

b) fast-tracking the development and implementation of the 2007-2013 long-term programme for the promotion of biofuels and other renewable fuels;

c) initiation (by the Ministry of Economy and the fuel sector) of measures aimed at placing three-component (multi-component) fuels on the market; for example, in Sweden, a significant percentage of the public transport fleet runs on E85 fuel (about 80-85% bioethanol, between 10 and 20% gasoline and 1-3% stabilizers) – this, however, requires minor engine design modifications – and on E95 (95% bioethanol);

d) initiation of work on ”agricultural fuel” to place on the market diesel oil containing about 10% of bioethanol, 20-30% esters and 60-70% so-called standard diesel oil. Existing Polish technologies and proposals for manufacturer standards may be useful in this context. Agricultural fuel does not require any engine or vehicle design modifications;

e) assessment of the possibility of introducing legislation (similar to laws already in place in many US states) which would:

- oblige Polish State and public transport operators to buy vehicles designed to run on fuels containing more than 5% biocomponents (particularly public buses and company cars);
- introduce an obligation to run these vehicles on biofuels (gasoline containing at least 8% to 10% bioethanol and diesel oil containing at least 30% esters) for which their engines have been designed.

f) analysis of the legal feasibility of linking excise duty reductions on liquid fuels containing biocomponents with the principle that fuel price should be proportional to its energy content (this would be justified in the context of State aid being given and the lower energy content of biofuels);

g) analysis of the legal feasibility of introducing charges on fuel manufacturers for selling fuels which lead to increased greenhouse gas emissions. A similar rule is already in place in the case of electricity, whereby producers are obliged to generate a certain percentage of electricity from renewable sources. Non-compliance results in severe penalty charges;

h) securing financial support for the construction of agro-refineries, i.e. ester installations (and eventually bioethanol installations); considering their significance for national energy security and environmental protection, they should be supported in a similar way as in other EU Member States and be given due attention in the National Cohesion Strategy for 2007-2013;

i) initiation and prompt finalisation of legislative work required for full implementation of Directive 2003/30/EC.

3.4 France

3.4.1 Development of biodiesel in France

After the European CAP (Common Agricultural Policy) reform in the early 1990's, biofuels gained interest in France. The French government put a legislative framework and fiscal incentives for the production and use of biofuels in place, and the first significant quantities of biofuel were commercially produced in 1993.

Following that, the development of both biofuel chains (biodiesel and bioethanol) was actually based on two interrelated elements:

I. the European Union regulations and their transposition to the national law system through industrial capacity approvals by regulation authorities;

II. tax exemptions. The European Commission decree (April 9, 1997) that approved the tax exemption regime applied to predefined volumes of biofuels and was based on EU Directive 92/81-Article 8-section 2 [EC 1992].

After BP Chemicals Ltd. lodged a complaint against France, the European Court verdicted that, given the level of development of the activity, it could no longer be considered a pilot project. In response to that France demanded that dispensations could be granted according to section 4 of the Directive 92/81-Article 8 [EC 1992] focusing on specific policies of Member States.

At that time, two proposals were examined by the Commission services. The first concerned modification of the directive 92/81 to give the possibility to apply less tax rates to fuels containing biomass-origin components. The second, considered an obligation of incorporation of biofuels to fuels of fossil origin [Rozakis & Sourie 2005]. It was the basis for the formation of EU Directive 2003/30 [EC 2003].

Commercial biodiesel plants

The production of biodiesel on commercial scale started in France in 1992. Between 1993 and 1996 a number of biodiesel production plants were put into service. After that, granting of new production authorisations stalled and the production of biodiesel stabilised [Van Walwijk 2005].

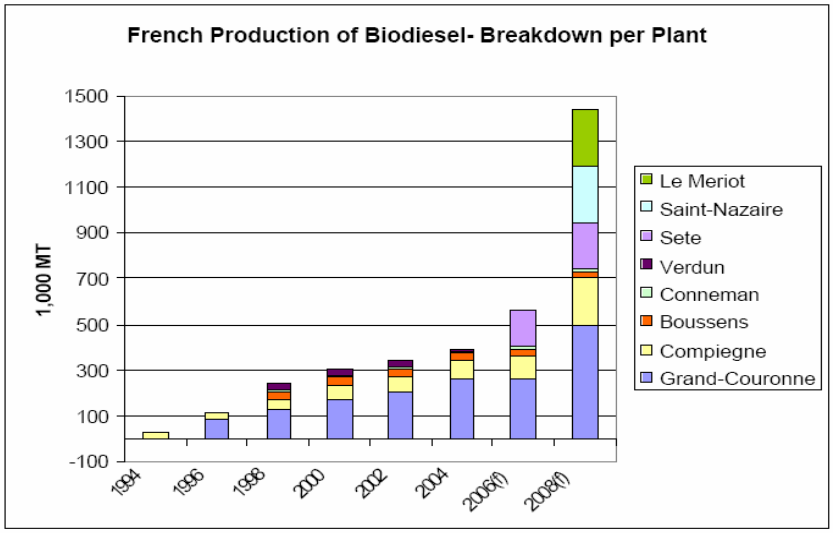

Fig. 3-6 Biodiesel production per plant in France (1994-2008) [Hénard 2006]

The first industrial biodiesel unit, which produced rapeseed methyl ester (RME), was built in Compiègne in 1992 and had an initial capacity of 20,000 tonnes per year. In 2004, the authorised production capacity of this unit had increased to 83,500 tonnes per year. Initially the outlet for VOME was targeted at public transport vehicle fleets, which may be allowed to use up to 30% VOME blended in their diesel fuel [Hénard 2006].

The maximum production capacity of each plant is indicated in Table 3-8.

Table 3-8 Production capacities and quotas for biodiesel plants from 2004-2010 (in thousands of tonnes) – 2008: estimations

Location	2004	2005	2006	2007	2008	2010
Grand-Couronne	260	260	260	260	510	n/a
Compiegne	83.5	100	200	200	200	n/a
Boussens	33	40	40	40	40	n/a
Sete	0	0	200	200	200	n/a
Saint –Nazaire (Façade Atlantique)	0	0	0	250	250	n/a
Le Meriot	0	0	0	250	250	n/a
Coudekerke	0	0	0	0	250	n/a
Bordeaux	0	0	0	0	250	n/a
Total	376.5	400	700	1,220	1,950	n/a
Production Quota		417.5	677.5	1.342.5	2,282.5	3,232.5

Source: Hénard 2007

3.4.2 Current situation of biodiesel in France

France currently produces and consumes the following biofuels [Hénard 2006]:

- Biodiesel: Vegetable Oil Methyl Ester (VOME) is derived from rapeseed oil and sunflower seed oil. VOME is mixed with diesel at the rate of 5% for general use and 30% in captive fleets for public transportation.
- Bioethanol: Ethanol is derived from sugar beets or wheat, and Ethyl Tertiary Butyl Ester (ETBE) is derived from ethanol. Ethanol and ETBE are incorporated into gasoline at a maximum rate of 15%. Since 2004 direct blending of ethanol is allowed, but so far it occurs only on a very limited scale.

Biodiesel production in 2005 was 492,000 tonnes, while the production capacity for 2006 reaches 775,000 tonnes [EBB 2006].

Table 3-9 Amounts of biofuel produced in France from 2003 to 2005

Year	Biodiesel (t)	Ethanol (t)	ETBE (t)
2005	492,000		
2004	348,000	102,000	170,600
2003	357,000	82,000	164,250

Sources: EUROBSERV'ER 2005; EBB 2006

About 90% of the VOME that is produced today is used in automotive diesel fuel; the rest is used in domestic fuel oil [EUROBSERV'ER 2005].

In 1999, 4,000 vehicles were running on a mixture of diesel with 30% VOME in France and these vehicles had then covered over 200 million kilometres. Today 7 out of 13 French refineries are blending VOME into diesel fuel at a rate between 2% and 5%. The oil company Total is the largest player on the biodiesel market in France. In 2004 it purchased close to 75% of the authorised quantity to incorporate it at a level of 2% in its diesel fuel produced in six French refineries [Van Walwijk 2005].

In 2005, French consumption of 370,000 tonnes of biodiesel represented 1% of domestic diesel use . To meet French government utilisation goals for 2006 (1.75% in calorific value - corresponding to 1.9% in volume), the French will have to increase their consumption to 630,000 tonnes of biodiesel [EUROBSERV'ER 2005].

3.4.3 Drivers and barriers for biodiesel in France

EU Directive 92/81/EEC

European Directive 92/81/EEC [EC 1992] in 1992 allowed a defiscalisation for pilot projects on biofuels. France allowed a tax exemption of 100% for biodiesel and 80% for bioethanol during the 1990's. This measure lead to such a high production level of biofuels (about 420,000 tonnes in 2000) that France was confronted with protests from Europe . The

production level was considered too high for pilot projects as meant by the Directive [Rozakis & Sourie 2005].

EU Biofuels Directive (2003/30/EC)

The requirements of European Directive 2003/30/EC [EC 2003] on biofuel use for transportation (2% in 2005 and 5.75% in 2010) have made biofuel activities in France gain new momentum. The European goals are included in the 'Law on Energy Policies 2005' [EUROBSERV'ER 2005] and the State is taking measures to support the construction of new biofuel production capacity.

National Programme

Plan 'Climat' (July 22, 2004): The climate plan of the French government aims to come up with clear actions to meet the Kyoto protocol goals regarding greenhouse gas emissions for the year 2010. It not only addresses CO_2 emissions from fossil fuel combustion, but for example also methane emissions and greenhouse gas emissions from air-conditioning systems are included. The types of actions that are described are diverse and include reducing energy consumption, informing and educating the public and stimulating research. The chapter on sustainable transport contains sections on: reducing the greenhouse gas emissions from road vehicles, improving the efficiency of urban transport, developing low CO_2 emitting transport modes like rail, and stimulating vehicle research. [Van Walwijk 2005]

One of the ways to reduce vehicular greenhouse gas emissions that is mentioned is the use of biofuels. Even though the percentages of biofuels specified in European Directive 2003/30/EC are indicative, the climate plan states that France is committed to meet the 5.75% goal for the year 2010. Implementing the Directive should reduce the CO_2 emissions from road transport by 7 million tonnes CO_2 equivalent. [Van Walwijk 2005]

Plan 'Biocarburants' (September 7, 2004): The plan for biofuels in transportation makes one of the actions to reduce greenhouse gas emissions of the climate plan concrete. The biofuels plan describes measures to implement European Directive 2003/30/EC. It serves three purposes for France: reducing greenhouse gas emissions from the transportation sector, increasing energy independency and stimulating the agricultural sector. The ministry of economy, finances and industry is responsible for the implementation of the biofuels plan. On September 7, 2004, the prime minister presented the first phase of the plan 'Biocarburant' for the period between 2005 and 2007. In a second phase, more production capacity will be built to meet the European goal on biofuels for 2010. [Van Walwijk 2005]

Investment support: It seems that on a national level there is no investment support for automotive biofuels available [Van Walwijk 2005].

Support for bioenergy production: In line with European Regulation 1782/2003 and the Common Agricultural Policy of the European Union, French farmers can ask for 45 Euro per hectare support for growing certain energy crops [Van Walwijk 2005].

Local support: There are many regional and local activities that receive financial support from 'Régions' and/or local authorities. They are typically co-operations between farmers producing energy crops, enterprises that convert the crops into biofuel, and sometimes fleet owners

that purchase the fuel. Also many cities have programs on improving urban air quality and as part of their measures they may be stimulating the use of biofuels in urban fleets like city buses and municipal service vehicles [Van Walwijk 2005].

Quota System

A system of authorised production quantities granting a reduction of the internal tax on petroleum products (TIPP) for automotive biofuels has been established by the authorities to make biofuels commercially viable [Hénard 2006].

Besides its use in vehicles, blending of biofuels in domestic heating oil is also tax exempt.

Recently, the French Government announced that, in order to reach the EU Commission (EC) objectives of biofuel incorporation into conventional fuels set in the Directive 2003/30/EC, France would increase the quota for tax relief to 880,000 tonnes by 2007 (see FR5002 and FR5018) and accelerate biodiesel incorporation into total fuel consumption from the current 5.0% to 5.75% by 2008 (two years earlier than required), 7% by 2010 and 10% by 2015 [Hénard 2006].

Table 3-10 French quotas for biofuels

Quotas for biofuels vegetable oil	**Methyl ester used as biodiesel** (t)	**Ethanol and ETBE* used as bioethanol** (t)	**Total** (t)
2005 approved quota	417,500	100,000	517,500
Additional quota announced in September 2004	560,000	320,000	880,000
Additional quota announced in September 2005	1,335,000	465,000 (ethanol: 380,000 & ETBE: 85,000)	1,800,000
Total projected in 2008	2,312,500	885,000	3,197,500

* Ethyl tertiary butyl ether

Source: Hénard 2006

For 2005, the government established a 517,500 tonnes (417,500 t for biodiesel, 100,000 t for bioethanol) quota for tax relief, however, total tax relief claims, including bioethanol, ETBE and VOME, only reached 504,000 tonnes (up from 467,500 tonnes in 2004) [Hénard 2006].

These volumes were based on projected French consumption of 35 million tonnes of diesel fuel and 10 million tonnes of gasoline in 2008.

Biofuel Taxes

Starting in 1992, biofuels were exempt from the internal tax on petroleum products (TIPP). Later during the nineties the full exempt was changed to a system with a TIPP reduction for biofuels of which the amount is specified per hectolitre or per tonne (biofuels were granted a TIPP exemption: 100% for biodiesel (VOME) in diesel fuel and 80% for bioethanol incorporated as ETBE in gasoline. The amount of the TIPP reduction is reconsidered annually. This tax reduction is applicable to the use of biofuels for transportation and for domestic heating.

The TIPP reduction is available for the authorised amounts of biofuels. When larger quantities are produced, the surplus does not profit from this tax reduction. After new European regulations have come into force, biofuels are now granted a partial tax exemption for the TIPP, of which the amount is annually revised by the government to take economic developments into account.

In 2005, biodiesel and bioethanol fuels were taxed relative to diesel fuel and gasoline, as shown in Table 3-11.

Table 3-11 Changes in biofuels taxation in 2005

Product	**2005 Tax** (€/l)	**2005 Tax Cut** (€/l)	**2005 Final Tax** (€/l)
Diesel fuel	0.42		0.42
VOME (biodiesel)	0.42	0.33	0.09
Gasoline (unleaded)	0.59		0.59
Bioethanol	0.59	0.37	0.22
ETBE (used as bioethanol)	0.59	0.38	0.21

Source: Hénard 2006

Because the public cost of supporting biofuel production results in lower tax gains for the government's budget, the 2006 financial bill increased the tax rate to 0.33 from 0.25 Euro per litre for biodiesel and to 0.37 and 0.38 from 0.33 €/l for bioethanol and ETBE for 2006.

In France there is also a general tax on pollutant activities (TGAP), also called "ecotax". Since January 1, 2005, resellers of automotive fuels are imposed TGAP on the amount of fuels that they sell. However, eventual biofuel components in these fuels are exempted from this tax [Van Walwijk 2005]. The TGAP is based on the selling price of the fuels, before VAT (value added tax). The tax rate was 1.2% in 2005 and will increase annually until it has reached 5.75% in the year 2010. The TGAP tax rate is diminished by the percentage of energy content (based on the lower calorific value) of biofuel that is present in the fuel sold for:

- VOME in diesel fuel,
- bioethanol incorporated in the form of ETBE in gasoline,
- pure bioethanol that is blended in gasoline.

This means that for example the net TGAP in 2010 will be zero for an automotive fuel containing 5.75% biofuel.

Table 3-12 TGAP (ecotax) rate on automotive fuels

	2005	**2006**	**2007**	**2008**	**2009**	**2010**
TGAP	1.2%	1.5%	3.0%	4.0%	5.0%	5.75%

Source: Van Walwijk 2005

The TGAP reduction for the biofuel component in automotive fuels is meant to contribute to make France meet the 5.75% goal for biofuels in 2010 of European Directive 2003/30/EC.

Sustaining employment in agriculture

Initially, sustaining employment in the agricultural sector and its related industries was the driving force for the French government to develop a legal framework that stimulates the use of biofuels.

Reducing dependency on fossil fuel imports and environmental reasons later became additional drivers [Van Walwijk 2005].

The major reform of the European Common Agricultural Policy (CAP) in 1992 that lead to set-aside agricultural land had a negative impact on the agricultural sector and related industries in France. [Rozakis & Sourie 2005]

Faced with the consequences of the CAP reform, the French government chose to stimulate industrial use of set-aside land by creating a regulatory and fiscal framework to encourage the development of biofuels for automotive and domestic applications.

Two ways of support were established:

i) financial incentives for the production of biofuels and stimulating research to improve the competitiveness of biofuels or to assess the economic and

ii) technical interest for non-food use of agricultural products [Van Walwijk 2005].

Supporting industrial development

European Directive 92/81/EEC in 1992 allowed a defiscalisation for pilot projects on biofuels. France allowed a tax exemption of 100% for biodiesel and 80% for bioethanol during the 1990's.

Reducing dependency on fossil fuels

The requirements of European Directive 2003/30/EC on biofuel use for transportation (2% in 2005 and 5.75% in 2010) have made biofuel activities in France gain new momentum. The European goals are included in the national programme to combat climate change.

3.5 United Kingdom

3.5.1 Development of biodiesel in the United Kingdom (UK)

With a total energy consumption of 57 million tonnes of oil equivalent (toe) in 2004, the UK transport sector accounts for approximately a third of the total UK energy use in 2004 (161 million toe), DTI Digest of UK Energy Statistics[1], and is dominated by gasoline, diesel

[1] Data is quoted on energy supplied basis, and excludes non-energy use of fuel and conversion losses.

and aviation fuel[2]. Cars, motorcycles and taxis account for the majority of gasoline use, whereas light and heavy goods vehicles predominately use diesel oil. [DFT 2006]

Following the EC Biofuels Directive 2003/30/EC, the UK government set a target of 0.3% of total UK fuel sales by the end of 2005.

In addition to that, a 30 €/l duty incentive on biodiesel has been in place since July 2002, and a similar duty incentive for bioethanol was introduced from January 1, 2005.

This policy has seen sales of biodiesel increase rapidly, currently running at some 2 million litres a month (DFT Transport Statistics for Great Britain[3]). To a large extent, production is from waste vegetable oil (WVO), since this is currently the cheapest way of producing biodiesel.

Budget 2006 announces an extension of the duty incentive at 20 pence per litre in 2008-09, offering further certainty to the industry.

The total sales of biofuels in the UK in 2004 were some 20,990,000 litres, whilst total road fuel sales were approximately 48 billion litres. As a percentage of total road fuel sales, biofuels contributed about 0.04%.

Biodiesel sales currently make up less than 0.1% of total diesel sales, however, and as a percentage of total gasoline and diesel fuel sales, biodiesel sales make up less than 0.05% .

3.5.2 Current situation of biodiesel in the United Kingdom (UK)

Budget 2007 announced the extension of the 30 €/litre duty incentive for biofuels until spring 2010, offering further certainty to the industry [DFT 2007].

The total sales of biofuels in the UK in 2006 were some 264 million litres, whilst total road fuel sales were approximately 489 billion litres. As a percentage of total road transport fuel sales, biofuels made up 0.54% by volume, or some 0.45% by energy content. This represents an increase of approximately 125% over the previous year, when total sales amounted to 118 million litres. [DFT 2007]

Most biofuels are sold in blends, the vast majority at or below the 5% level which is in line with European road fuel standards EN590 and EN228.

Biodiesel is currently produced from indigenous rapeseed oil, recycled cooking oil, tallow, other waste oils and imported palm oil. It is currently available at over 100 filling stations in the UK, including a number of major supermarket sites [DFT 2006]. The monthly sales of biodiesel and bioethanol in the UK during 2006 are indicated in Fig. 3-7.

[2] Petroleum accounts for over 98% of transport energy use, the remainder is electricity accounted used for rail transport (DTI 2006).

[3] See webpage “Towards a UK Strategy for Biofuels – Public Consultation” at http://www.dft.gov.uk/stellent/groups/dft_roads/documents/page/dft_roads_028393-04.hcsp#P102_13975#P102_13975 (May 22, 2006).

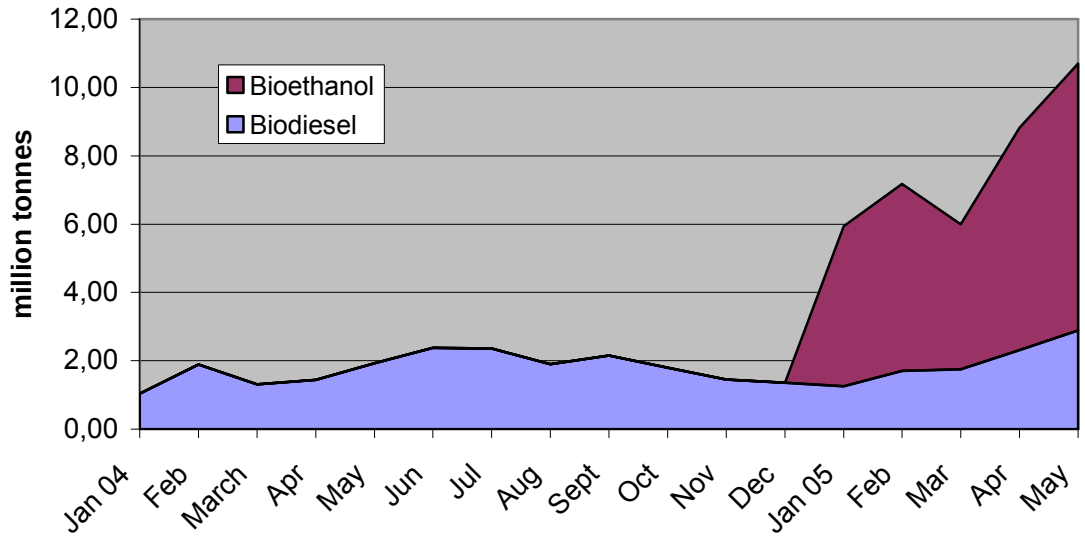

Fig. 3-7 Monthly sales of biodiesel and bioethanol in the UK during 2006 (Source: DFT 2007)

UK's biggest biodiesel plant opened in the end of June 2006 in Teeside and it is the largest biofuels complex in the country. The plant is expected to have an annual production of 250,000 tonnes biodiesel a year using rapeseed, palm and soybean [DFT 2007].

Biodiesel oil seeds

Oilseed rape is the crop most likely to provide large volumes of competitively priced oil for biodiesel production in the UK for the foreseeable future. Average yields across the UK are typically around 3 tonnes per hectare (t/ha), though the best growers can achieve around 4 t/ha. Current rapeseed oil production in the UK is estimated at 450,000 tonnes and national crushing capacity exceeds crop potential. [DFT 2007]

One tonne of rapeseed produces 0.38 tonnes of Rapeseed Methyl Ester (RME). Based on average UK yields of 3 t/ha, this gives a potential RME production potential of 1.14 t/ha of rapeseed cultivation in the UK. Typical costs of RME production available in the public domain range from 0.40 to 0.48 €/l, though some industry figures are reportedly higher. [DFT 2007]

Commercial biodiesel plants in the UK

At present there are three biodiesel plants in the UK at different stages ranging from recently established or being at the planning stage [Booth et al. 2005]. The following section provides a brief review of each plant. In summary, the key aspects are shown in Table 3-13.

Table 3-13 Summary of UK Biodiesel plants

	Location	Plant Size	Feedstock	Investment
Argent	Motherwell	50,000 t	Used cooking oil, tallow	£15 million (~22 million €)
Northeast Biofuels Biofuels Corporation	Teeside	250,000 t	Rapeseed, palm, soybean	£46 million (~68 million €)
Greenergy Fuels Ltd	Immingham	120,000 t (113 million l)	Rapeseed, palm, soybean	£12-15 million (~17-22 million €)
				Source: DFT 2007

In the following paragraphs there is a detailed description of the UK biodiesel plants in terms of current state, feedstock, size, technology, capital investment, employment, marketing issues for biodiesel and lessons to be learned [Booth et al. 2005].

Argent

Argent Energy Limited was established in 2001 to investigate methods for adding value to animal by-products from the Argent By-Products rendering businesses. Argent Energy has recently built the UK's first large scale biodiesel plant near Motherwell.

Current State: Production of biodiesel started in April 2005 and the plant was due to be fully operational a few weeks later. There are plans to set up at least another 2 plants in other parts of the UK.

Feedstock used: Used cooking oil (UCO) and animals fats (tallow).

Technology: UCO and tallow are converted to fatty methyl esters. The plant has been constructed by Mowlem plc with Biodiesel International, an Austrian firm.

Capital investment: investment 22.5 million Euro, supported by about 1.8 million Euro in Regional Selective Assistance supported by the Scottish Executive and a further 3.27 million Euro from Europe to fund research and commercially assess the operation. The venture capital firm Cinven owns 60% of the parent group.

Employment: Fifteen skilled staff in addition to the management team.

Marketing of biodiesel produced: Most of Argent Energy's production will go into a blend of 5% biodiesel and 95% mineral diesel. It is sold to Teeside based Petroplus and marketed under the Bio-plus brand on filling station forecourts. It is claimed that Petroplus could buy upwards of 25,000 tonnes of biodiesel from Argent. This is shipped to refineries at Grangemouth and Teeside for blending. Argent is committed to ensuring adherence to European standards for biodiesel, mineral diesel and blended biodiesel.

Lessons to be learned: Utilising tallow, for which no payment is required, can give significant advantages to the economics. Feedstock are variable and Argent stress adherence to quality standards.

Teeside Developments

The Biofuels Corporation plc has built a biodiesel processing plant at Seal Sands, Middlesbrough, Teeside. This company was set up by Australians who saw an opportunity to develop biodiesel in the UK. It has recently been floated on the Alternative Investment Market.

Current state: A site has been selected for the crushing plant and North east Biofuels are in the process of arranging finances for the project. The plant opened end of June 2006.

Feedstock used: The crushing plant will be rape optimised, but North east Biofuels also intend to crush palm and soybean. The quantity of rapeseed used will be a function of the price, but suitability of the resulting oil to meet the biodiesel standard will also be a dictating factor. Temperature will also influence the blend of oils to be used with lower amounts of palm used in colder period of the year.
The Biofuels Corporation also plan to use a number of vegetable oil crops for biodiesel production. Initially the primary feedstock was planned to be the cheaper imported palm oil. The blend policy may be changed in view of quality issues associated with palm oil biodiesel for Northern climates.

Technology: The crushing plant will be rapeseed optimised and will use solvent extraction. Northeast Biofuels are in discussions with engineers de Smet for construction. Energea biodiesel technology will be used in the Biofuels Corporation biodiesel plant.

Capital investment: The crushing plant was expected to cost between 24-27 million Euro. The biodiesel plant is expected to cost just over £28 million. It has been supported locally by One North East with a 1.8 million Euro grant.

Employment: Total number of employees at the biodiesel plant is now up to 40 and the plant will be run on a continuous shift basis.

Marketing of biodiesel produced: The group intend to supply markets where biodiesel is already established and to develop further markets, both in transport and other sectors.

Lessons to be learned: The large size of the crushing plant is stressed as of prime importance to its feasibility. A key comment in reports from this group is that *"biodiesel industry has moved from being driven by agriculture to being driven by petrochemical market*".

Greenergy Fuels Ltd (GFL)

Current state: Greenergy is a leading fuel importer, blender and distributor which is 25% owned by Tesco supermarket. GFL has been at the forefront of introducing low sulphur fuels and more recently developing retailing of biodiesel and ethanol via Tesco (branded as Globaldiesel), other supermarkets and local authorities. GFL are at an advanced stage of planning a 100,000 tonne biodiesel plant at Immingham connected to tank storage and import facilities provided by Simon Storage. Planning permission has been granted and building is expected to begin in the 3rd quarter of 2006.

Feedstock used: The plant will have flexibility in oil feedstock usage but is expected to use 65% rapeseed oil – equivalent to approximately 160,000 tonnes of rapeseed. The balance could be a combination of palm oil and soybean oil and used cooking oil depending on price.

Technology: Provided by Desmet Ballestra who have built several biodiesel plants in the EU. Capital investment Plant investment is estimated between 18-22.5 million Euro.

Employment: Up to 20 people

Marketing of biodiesel produced: GFL have created demand by developing the retail outlets in advance of building the plant.

Lessons to be learned: Develop distribution and retail outlets. Secure oilseed feedstock but ensure crushing capacity is available locally to minimise logistical costs.

A number of large plants are at the planning and construction stage including:

- In March 2007 Ensus announced that it had secured funding to build a 400 million litre/year bioethanol facility on Teeside using 1.2 million tonnes of wheat a year.
- Ineos are building a 500,000 tonne biodiesel plant in Grangemouth, Scotland.
- A number of other companies (including Green Spirit fuels, Vireol and Abengoa) have plans.

3.5.3 Drivers and barriers for biodiesel in the United Kingdom (UK)

National Policy & UK Measures to Promote Renewable Transport Fuels

EU Biofuels Directive (2003/30/EC)

The EU Biofuels Directive came into force in May 2003 and required Member States to set indicative targets for biofuels sales in 2005 and 2010 against “reference values” of 2% and 5.75%, respectively 2% by energy content. Following the EC Biofuels Directive (2003/30/EC), the UK government set a target of 0.3% of total UK fuel sales by the end of 2005 and 5% by 2010 (by volume of total road transport fuel sales [DFT 2006].

Fuel Duty

Fuel Duty differentials are currently the UK's primary means of support for biofuels. In addition to the 30 €/l duty incentive on biodiesel which has been in place since July 2002, a similar duty differential for bioethanol (a gasoline extender) was introduced on January 1, 2005.

Budget 2006 announced that the 30 €/litre duty differential would be guaranteed until 2008-2009, and budget 2007 has since extended it further to 2009-2010. The combination of fuel duty incentive and buy-out price in those two years (i.e. the first two years of the RTFO) will therefore amount to 52.5 €/litre. Thereafter, the Government has said that the combination of duty incentive and buy-out price will reduce to 45 €/litre in 2010-11. An announcement on the level of fuel duty incentive for biofuels for 2010/11 is expected in Budget 2008.

The Government takes into account all relevant economic, environmental and social factors in coming to a decision on the appropriate level of the duty incentive. Budget 2007 also set out a wider package of measures to support biofuels, including extending the biogas duty incentive at its current level until 2011-2012, thus giving five years worth of certainty to investors.

Capital Grants

Regional selective assistance (RSA) grants are one of the few methods of direct support for industry allowable under the EU's single market rules. Options for use of this assistance are limited in the UK, because qualifying regions do not necessarily match up with the most suitable areas for production facilities.

In particular, the Argent plant (see Table 3-13) in Scotland benefited from an RSA grant from the Scottish Executive of 1.8 million Euro. It started operating in March 2005. It has capacity for some 50 million litres of biodiesel per year – nearly 5% of Scotland's diesel fuel needs.

Enhanced Capital Allowances

The Government is looking at Capital Allowances as a measure to support investment in biofuels production facilities. Capital allowances allow the costs of capital assets to be written off against a business's taxable profits. 100% first-year enhanced capital allowances (ECA) allow a business to write off the whole cost of qualifying capital assets against the taxable profits of the period during which the expenditure is incurred. The accelerated tax relief can provide a cash flow benefit for businesses in profit and a net present value benefit of about 5%.

In the report covering the year 2005, it was mentioned that the UK Government had applied for State Aid approval for an enhanced capital allowance (ECA) scheme to support the most carbon-efficient biofuels plant. Following discussion with the European Commission the UK Government launched a further consultation with stakeholders. In light of this consultation process, the UK Government will re-apply for State aid clearance and, subject to that, will introduce a 100 per cent first-year allowance for biofuels plant that meet certain qualifying criteria, and which make good carbon balance inherent in their design, as proposed. In addition the UK Government will also introduce a payable enhanced capital allowance for companies not in taxable profit to ensure both profit and loss making firms have an incentive to invest in the cleanest biofuels plant. The UK Government will continue to monitor the development of innovative and lower carbon biofuels production methods, and consider the most effective form of on-going support.

Renewable Transport Fuel Obligation

The UK Government has conducted a feasibility study and consultative process to explore the prospects for a Renewable Transport Fuels Obligation (RTFO) as a possible mechanism to promote renewable fuels into the long term. It would be limited to the road transport sector, at least initially. An RTFO would place a legal obligation on specified transport fuel suppliers to supply a specified proportion of their road fuel supplies to their customers in the UK from renewable energy sources.

The Department for Transport (DFT) held a series of stakeholder workshops to discuss how an RTFO might operate, and also commissioned two pieces of research on some of the detailed design aspects.

In addition, budget 2007 also confirmed that RTFO buy-out price – the price paid by fuel suppliers who fail to meet their obligation for the year by producing certificates showing biofuel supply – will remain at 22.5 €/litre for the second year of the Obligation (i.e. 2009-2010). The combination of duty incentive and buy-out price is then due to 45 €/litre in 2010-11. The Government expects that the emphasis will move from duty incentive towards buy-out price as the principal support mechanism in the future. The Government's intention is that the level of the RTFO buy-out should be sufficiently high to ensure that obligated suppliers do not routinely resort to using it, and so will keep the level of the buy-out price under review.

Regional Selective Assistance Grants

As outlined in last year's report, regional selective assistance grants are one of the few methods of direct support for industry allowable under the EU's single market rules. During 2006 the Scottish Executive and the Regional Development Agencies continued to offer support to a number of businesses in the sector. The Scottish Executive confirmed that it would provide a 13.5 million Euro grant towards the construction of a 500,000 tonne biodiesel plant at Grangemouth, due to come on stream in 2008

Table 3-14 Drivers & Barriers for biofuels in the UK

Issue	Biodiesel	Bioethanol
Key environmental benefit	Low carbon dioxide (greenhouse gas) on a whole of life basis. Also low particulate.	Potentially low carbon dioxide (greenhouse gas) on a whole of life basis.
Production plant capital cost	Low capital cost (typical depreciation less than €15 per tonne and year). As such, production economics are not materially affected by capital allowances.	**High capital cost (typical depreciation more than 150 Euro per tonne and year).** As such production economics are positively affected by capital allowances.
Raw materials	**Food grade vegetable oils such as rapeseed oil, corn oil or used cooking oil, which are high value in their own right, making biodiesel production a relatively low margin business.**	Sugary or starchy crops, or wastes such as straw, industrial or domestic waste, which tend to be relatively low value or even “free”, making bioethanol production a relatively high margin business.
Economic drivers to a successful market	Reducing feedstock cost and increasing product value are the drivers that make biodiesel economically attractive. This is typically done through excise duty incentives.	Reducing capital cost and increasing product value are the drivers that make bioethanol economically attractive. This is typically done through capital allowances and excise duty incentives.
Supply and demand	There is a shortage of diesel fuel in the UK and demand is continuing to increase, with much of the UK’s diesel now being imported from Russia and Nordic Countries. Production of biodiesel helps mitigate this shortage, and may have other additional boundary benefits.	**There is a surplus of gasoline in the UK and demand is continuing to fall, with much of the UK’s gasoline now being exported to America.** **Production of bioethanol further impacts this surplus and may have other negative additional implications.**

Source: Greenergy 2003

Deliverable 12
Best practice report

4 Best practices

This chapter presents examples of best practices which are understood as successful measures for the promotion of biodiesel production and consumption. As different types of measures, the following are distinguished:

- **Legislative measures** establish the framework on all levels which is an important prerequisite to the successful introduction of biodiesel
- **Economic measures** give an incentive or directly support feedstock provision, biofuel production and distribution, the biofuel compatible vehicle fleet and biofuels in general on the transport fuels market
- **Informational measures and cooperation** can further support the acceptance and diffusion of biofuels on the market

4.1 Legislative measures

Standardisation and quality management in respect to biodiesel has been identified as a main prerequisite for biodiesel production and use. Examples for important legislative initiatives are described in the following:

- Already in 1991 Austria defined the first standards and test methods for biodiesel worldwide with the ÖNORM C 1190. In 1997 the ON C 1191 also defined standards for fatty acid methyl esters (FAME). This standard, together with the DIN 51606, was the basis for the European standard EN 14214 which became effective in 2004 [CEN 2003]. The definition of standards was an important step for the commercial production of biodiesel.
- Also in Germany, as early as 1994, the first preliminary norm for biodiesel produced from plant oils was established by the German Institute for Standardisation: DIN V 51606. This norm was improved and refined in the following years and published in a second version, DIN E 51606, in September 1997. It defined biodiesel as fatty-acid methyl ester (FAME) [ÖBI 2002]. It had still the status of a draft standard, was however fully valid and set the technical basis for almost all approvals for biodiesel by the automobile industry [AGQM 2004]. In November 2003, the European norm EN 14214 [CEN 2003] was published in Germany as DIN EN 14214 [DIN 2003] and replaced the previous German standard of biodiesel. This standardisation process of biodiesel helped to overcome initial technical problems which have been experienced by biodiesel users in the mid of the 1990's due to varying biodiesel qualities and have led to large acceptance.
- Apart from the official norm, there is an organisation in Germany striving for standardisation called 'Arbeitsgemeinschaft Qualitätsmanagement Biodiesel e.V.' (AGQM, Association for the Quality Management of Biodiesel). It was founded in November 1999 on initiative of the UFOP (Union for the Promotion of Oil and Protein Plants, Berlin). This addi-

tional standard goes beyond the European norm and helped to further increase the operability and acceptance of biodiesel on the German market.

4.2 Economic measures

Though legislation has been an important prerequisite for the widespread use of biofuels, especially economic and fiscal incentives have been important driver for increasing biodiesel production and use. While direct subsidies have mostly been given on the level of feedstock provision and to establish the infrastructure for biodiesel production and distribution, taxation measures have been most important to increase biodiesel demand on the transport fuels market.

4.2.1 Direct subsidies

Direct subsidies have been mostly granted for the agricultural production of biomass and industrial processing of biomass into biodiesel. In some countries (e.g. France), sustaining employment in the agricultural sector and its related industries was the driving force for the government to develop a legal framework that stimulates the use of biofuels. Important examples for direct subsidies are:

- The major reform of the European Common Agricultural Policy (CAP) in 1992 that lead to set-aside agricultural land had a negative impact on the agricultural sector and related industries in France. Faced with the consequences of the CAP reform, the French government chose to stimulate industrial use of set-aside land by creating a regulatory and fiscal framework to encourage the development of biofuels for automotive and domestic applications. Two ways of support were established:
- financial incentives for the production of biofuels and stimulating research to improve the competitiveness of biofuels or to assess the economic, and
- technical interest for non-food use of agricultural products [Van Walwijk 2005].
- In Poland subsidies are granted for farmland area on which rapeseed is grown. According to the latest law on excise duty exemptions (the Act of 11 May, 2007) approved by the President, an additional support for farmers of PLN 176 (approx. 45 Euro) per hectare is to be granted for those signing the long term contracts to supply feedstock to biofuel producers [PLG 2007a]. The law also imposes penalty for not adding biocomponents for fuels.
- Regional selective assistance (RSA) grants are one of the few methods of direct support for industry allowable under the EU's single market rules. Options for use of this assistance are limited in the UK, because qualifying regions do not necessarily match up with the most suitable areas for production facilities. In particular, the Argent plant in Scotland benefited from an RSA grant from the Scottish Executive of 1.8 million Euro . It started operating in March 2005. It has capacity for some 50 million litres of biodiesel per year – nearly 5% of Scotland's diesel fuel needs [DFT 2007].

4.2.2 Taxation

While direct subsidies have been mostly used on the level of feedstock provision and biofuel production and distribution tax relieves and obligatory blending of biodiesel mainly target at biodiesel consumption on the market:

- In Germany, the 100% tax exemption for all biofuels for transportation was certainly the most important incentive for biofuels. Furthermore, in 1999 a step-by-step increase of the mineral oil tax was introduced among other things under the framework of the so-called ecological tax reform (Ökologische Steuerreform).
- The Austrian government also exempt biodiesel from the mineral oil tax at an early stage in order to support biodiesel consumption. From the start of commercial biodiesel production in Austria, usage of 100% biodiesel was fully exempt from mineral oil taxation. In 1999, blends of up to 3% of biodiesel were also exempt from taxation.
- In Poland, in response to continued industry complaints that tax breaks were too small to offset additional costs related to biofuel production, the Polish Parliament approved additional incentives for biofuel production on May 11, 2007. Under the new legislation, the excise tax exemption for biofuel producers has been increased by about 5% for each litre of esters added to biodiesel while the excise tax for 100% biodiesel fuels has been reduced to almost zero. The new taxation shall be implemented as from the date of publication of a European Commission decision confirming compliance of the State aid envisaged with the rules of the common market (this should be the case at the end of 2007). The new taxation shall be implemented as from the date of publication of a European Commission decision confirming compliance of the State aid envisaged with the rules of the common market (this should be the case in the end of 2007). B100 is also exempted from the additional road tax that is imposed on regular diesel, which was not the case in the previous version of the excise duty law.
- Starting in 1992, biofuels were exempt from the internal tax on petroleum products (TIPP) in France. Later during the nineties the full exempt was changed to a system with a TIPP reduction for biofuels of which the amount is specified per hectolitre or per tonne (biofuels were granted a TIPP exemption: 100% for biodiesel (VOME) in diesel fuel and 80% for bioethanol incorporated as ETBE in gasoline). The amount of the TIPP reduction is reconsidered annually.
- In France there is also a general tax on pollutant activities (TGAP), sometimes called “ecotax”. Since January 1, 2005, resellers of automotive fuels are imposed TGAP on the amount of fuels that they sell. However, eventual biofuel components in these fuels are exempted from this tax [Van Walwijk 2005].

Due to a considerable gap between the biodiesel production and actual biodiesel consumption in Austria and in light of the EU biofuels directive which aims to achieve market share of 5.75% by 2010, the Austrian Government has implemented a substitution requirement:

- This revision of the Fuels Decree requires a proportion of 2.5% biofuels or other renewable fuels, calculated on the basis of the total energy content of the gasoline and diesel

fuel launched on the market in the transport sector each year from April 2005. This proportion should increase to 4.3% in April 2007 and to 5.75% in April 2008.

4.3 Informational measures and cooperation

Finally, also information campaigns and cooperation activities are an important issue to achieve public acceptance of biodiesel. Campaigns have also put forward the previously mentioned legislative and economic measures on all levels. A best practice example is the UFOP (Union for the promotion of oil and protein plants), which has been founded as a completely new organisation in Germany already in 1990. The initiators have been the 'Deutsche Bauernverband e. V.' (DBV, Society of German Farmers) and the 'Bundesverband Deutscher Pflanzenzüchter e. V.' (BDP, Federal Society of German Plant Breeders). All companies, associations and institution participating in the production, processing and marketing of indigenous oil and protein-bearing plants are part of UFOP. The main tasks are:

- political lobbying to national and international authorities,
- optimisation of agricultural production by promoting research and supporting experiments with different plant varieties,
- development of new means of exploitation and
- public relations work to promote the sales of all end products on indigenous oil and protein-bearing plants.

Deliverable 13
Sussess factors and barriers

5 Barriers and drivers

This chapter summarises and categorises the main barriers and drivers for biodiesel production and use. The main issues along the biodiesel chain are

- feedstock availability
- biofuel production capacity
- biofuel standardisation and distribution
- availability of approved vehicles
- competitiveness of biofuels on the market

First, the main barriers are briefly described and afterwards the main drivers are summarised and categorised.

5.1 Main barriers

As the case studies Austria and Germany – both countries with a relatively long biodiesel history – show, the main barriers to the introduction of biofuels in the transport sector initially have been technical issues such as the

- quality of biofuels and
- availability and operability of approved vehicles.

These issues must be solved to achieve a common acceptance and increasing use of biofuels. Furthermore, the lack of clear legislation prevents trade in biofuels and rules out investment decisions. Banks treat investments in the construction of agro-refineries (ester installations) as high risk investments. As a result, the process of building adequate feedstock supply capacity can be delayed.

In the long run, however, the greatest barrier to biodiesel use in a mass market is a production cost which is higher than that of fossil fuel. Though in many countries this problem has been recognised and counteracted by tax exemptions, these are currently debated because CO_2 avoidance costs are comparatively high.

With production capacities increasing, further barriers connected to the availability of feedstock have been coming up:

- **Competing land use**: The potentials of biofuels from cultivated biomass depend foremost on the available land area. The land area for the production of biofuels can compete with the area for food production and the area for natural conservation. The technical potentials for biofuels are reduced considerably due to the observance for natural conservation aspects (including surface water and soil conservation).

- **Competing biomass usages**: Competing biomass usages greatly affect the potentials of biofuels. The potentials of biofuels are reduced drastically if the biomass potentials are rather used in stationary sectors than in the transport sector. There are no detailed potential estimations of biofuels that consider the competing usages of biomass available for the remaining reference areas (EU and the world).

5.2 Main drivers

The initial motivation for the promotion of biodiesel has been very different for the EU countries. While in Germany environmental concerns have been the main driver, in Austria it was especially the mineral oil crisis of the early 1970's that triggered initiatives to search for potential alternative fuel supply opportunities from renewable sources. In France, sustaining employment in the agricultural sector and its related industries was the initial driving force which led the government to stimulate the use of biofuels. Reducing dependency on fossil fuel imports and environmental reasons only later became additional drivers.

Besides these different initial motivations, similar additional instruments are available to overcome the barriers described in the previous section. These measures are therefore summarised and categorised as follows:

- legislative measures,
- economic measures,
- informational measures and cooperation.

5.2.1 Legislative measures

Numerous barriers to biodiesel production and use exist which can be influenced by legislative actions. Several such measures are already in implementation in the countries regarded in this report or are currently under discussion, as the case studies show. The availability of feedstock, for instance, can be improved by allowing the increased use of waste for the production of biofuels and by allowing the energy crop cultivation on set-aside land. Other legislative drivers can be roughly divided into obligations (quotas) and standardisations.

Obligations and quotas can be imposed on most levels of the biofuel chain such as

- the production of energy crops (quota for energy crops),
- the production of biofuels (biofuel quota),
- the import of biofuels (biofuel quota),
- the blending of biofuels (mandatory blending),
- filling stations (biofuel availability obligation),
- vehicle manufacturers (obligation to offer approved vehicles) and
- (public) fleet owners (obligation to purchase biofuel vehicles).

Standardisation and quality monitoring is most important to avoid technical problems resulting from poor biodiesel quality, for example. Therefore, fuel quality standards for pure biofuels and also for blending of biofuels into fossil fuels must be established and monitored. Currently, only a blend containing 5% biofuels is approved for use in conventional vehicles. This limit thus imposes a barrier to the blending of larger biofuel quantities; it could be overcome by stricter standards. Standards and labels thus can be used

- to allow higher blends of biofuels in fossil fuel and
- to label fuels which include certain shares if biofuels.

On the vehicle side, important drivers are the labelling of approved vehicles or including a certain biofuel compatibility in the type approval regulations and procedure:

- type approval regulations for new technologies (incl. biofuel operation) and
- labelling of biofuel-compatible vehicles.

Finally, incentives aimed at users, for example unrestricted access to city centres or free parking for biodiesel-fuelled vehicles, can also be additional drivers.

5.2.2 Economic measures

Economic barriers to biodiesel production and its use occur at all stages of the biodiesel chain: they can be addressed by direct (subsidies) or indirect (loans, tax reductions) support. Many concrete measures and programs providing financial relief or benefits to players involved in the biodiesel chain have been realised in the regarded countries, for example to boost the development of the necessary infrastructure.

Examples for such support at different levels are:

- funding of biofuel research
- subsidies and loans for
  - biofuel production facilities
  - biofuel distribution facilities (filling stations)
  - biofuel approved vehicles
  - conversion of conventional vehicles
- tax incentives for
  - biofuel producers
  - biofuel consumers (tax exemption or reduction)
  - biofuel vehicle owners (reduced vehicle tax)

Most economic measures aim at overcoming investment barriers for biodiesel production and distribution and at making biodiesel more competitive with regard to fossil fuels. Additional financial incentives can be created for users of biofuel vehicles as reduced parking fees or urban road tolls.

5.2.3 Informational measures and cooperation

Besides hard drivers such as legislative and economic pressure, soft measures such as marketing campaigns, networking and cooperation agreements can also be important drivers. The case studies regarded in this report show a great variety of such informational measures and cooperation agreements which can be designed fairly exactly to the actual framework conditions in a country or region at a specific time.

Marketing and information campaigns can be undertaken at different levels. Feedstock availability, for instance can be supported by informing farmers about energy crops and by initiating the collection of residues from the public. Other possibilities are

- informing distributors about technical issues of biofuel distribution (standards etc.),
- informing vehicle sellers on the availability and standards of approved vehicles,
- informing the public on biofuel issues and creating public awareness.

Voluntary commitments from biofuel producers, fuel distributors, vehicle manufacturers or fleet owners can further contribute to securing biofuel the supply and demand. Cooperation agreements and networking between different stakeholders are also important, for example between

- farmers and biofuel producers,
- vehicle manufacturers and fuel providers,
- vehicle manufacturers and fuel distributors.

6 Summary and conclusions

The goal of this work package is to “collate information on emerging best practices and commercialisation of biodiesel in leading European Member States and understand how this can be adapted and transferred to participating countries”. For this purpose, the development and current status of biofuel use in Germany, Austria, France, the United Kingdom and Poland were evaluated as the most successful and promising case studies for the application of biodiesel within the EU25. Following this, the successful economic and legislative as well as informational promotion measures were identified, collected and discussed in terms of possible best practice indicators. Finally, all important factors with driver or barrier functions were analysed and reviewed, with focus on the following main issues: feedstock availability, biofuel production capacity, biofuel standardisation and distribution, availability of approved vehicles and competitiveness of biofuels on the market.

From the in-depth analysis of the development of biodiesel use in EU Member States leading in this field, numerous parameters which have promoted or inhibited biodiesel, i.e. so-called drivers and barriers, were identified.

Drivers

The most prominent drivers for biodiesel production and consumption can be categorised in three groups:

legislative measures

- biofuel-favourable regulations and standards, e.g. allowing the cultivation of energy crops on set-aside land, using biomass waste for biofuel production or higher shares in fuel blends
- quotas for energy crops and biofuels themselves, e.g. domestic production or imports
- mandatory blending
- obligations to offer and/or purchase approved vehicles and biofuels as well as to label these accordingly

economic measures

- funding of biofuel research
- subsidies and loans, e.g. for feedstock and biofuel production, distribution facilities, biodiesel-approved vehicles or the conversion of conventional vehicles
- financial (e.g. tax) incentives aimed at biodiesel producers, consumers and vehicle owners

informational measures and cooperation

- marketing and information campaigns

- networking and cooperation issues

Barriers

The barriers are primarily linked to

- biomass availability,
- the quality of biofuels and
- the availability and operability of approved vehicles, especially regarding the use of pure biodiesel or blends with high biofuel shares.

Another issue which is not necessarily a barrier in the strict sense but which might make the promotion of biodiesel (and other biofuels) difficult is

- the public perception of biofuels as being disadvantageous in specific cases or under certain framework conditions. One example is the increasing number of reports on the damage (being) done to valuable ecosystems for the sake of biofuel promotion. Another is the call to reduce the economic burden on national economies caused by biofuel supporting measures, e.g. in Germany.

Conclusion

Especially for the participating countries as well as for all others seeking decision-making support in this field, this compilation can serve as an experience pool and thus be consulted in the context of designing a (national) strategy for promoting biodiesel (and other biofuels).

During the planning phase and implementation of such a policy, the specific situations and general framework conditions will always have to be considered. Therefore, it is also obvious that in the specific case, not all promotion measures described in this study can be realised simultaneously; in many cases this would even be unreasonable or impossible. If several measures are to be implemented in parallel, then these must at any rate be coordinated with each other if they are to effectively serve a (superordinate) goal. For example, if subsidies and loans are granted for the development of the biodiesel infrastructure (chain), then tax incentives will likely differ depending on the nature of the financial encouragement and will again be different if no subsidies or loans are granted.

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8 Annex

8.1 Currency exchange rates

Country	National currency	Exchange rate: (national curr. : Euro)	Date of calculation	Source (e.g. URL)
GB	Pound (£)	1 GBP= 1.5 Euro	August 10th, 2007	Reuters UK, currency calculator (http://uk.reuters.com)
PL	Polish zloty (PLN)	1 PLN : 0,2654 Euro	October 1st, 2007	National Bank of Poland (http://www.nbp.pl)

8.2 Alphabetical list of abbreviations

AGQM - Arbeitsgemeinschaft Qualitätsmanagement Biodiesel e. V. (Association for the Quality Management of Biodiesel, Berlin)

CRES - Center for Renewable Energy Sources (Greece)

CAP - European Common Agricultural Policy

DFT - Department for Transport (United Kingdom)

DIN - Deutsche Industrie Norm (German Industrial Norm)

DTI - Department of Trade and Industry; United Kingdom

EBB - European Biodiesel Board

EN - European Norm

ETBE - Ethyl tertiary butyl ether, fuel additive

IFEU - Institut für Energie- und Umweltforschung Heidelberg GmbH (Institute for Energy and Environmental Research Heidelberg, Germany)

FAME - Fatty acid methyl ester

KAPE - The Polish National Energy Conservation Agency

MEA - The Polish Ministry of Economic Affairs

PLG - The Polish Law Gazette

PMOE - The Polish Ministry of Economy

R&D - Research and development

RTFO - Renewable Transport Fuels Obligation

TGAP - French general tax on pollutant activities

TIPP - French internal tax on petroleum products

UFOP - Union zur Förderung von Oel- und Proteinpflanzen e. V.
(Union for the Promotion of Oil and Protein Plants, Berlin)

VOME - Vegetable oil methyl ester