



Energy research Centre of the Netherlands

# **European biofuel policies in retrospect**

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## Preface

This report gives an overview of the current developments regarding biofuel policies in various EU Member States. It was written as a contribution to a study, which will provide a thorough review of the complicated and sector-overarching issue of biofuels in India and South East Asian countries. This study is carried out within the framework of the ProBios (Promotion of Biofuels for Sustainable Development in South and South East Asia), which aims at promoting biofuels in the view of sustainable development in the South and South-East Asia. The project is co-ordinated by Winrock International India, and ECN, together with CIEMAT, is a partner in this project. The complete biofuels study carried out as part of the ProBios project will be published in the course of 2006.

The ProBios project is funded by the EU-Asia Pro Eco Programme. Asia Pro Eco is designed to strengthen the environmental dialogue between Asia and Europe through the exchange of policies, technologies and best practices that promote more resource-efficient, market driven, and sustainable solutions to environmental problems in Asia. The programme aims to support a series of preventive and corrective actions, which materialise in technical solutions that contribute to both quality of life and economic prosperity in Asia.

This project is registered at ECN under project number 7.7706. This report can be downloaded at the ECN website: [www.ecn.nl](http://www.ecn.nl). For further information, questions and comments, please contact Ms. E. van Thuijl at [vanthuijl@ecn.nl](mailto:vanthuijl@ecn.nl).

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## Abstract

Despite the benefits of the production and use of biofuels in the fields of agriculture, security of energy supply and the environment, in India and surrounding countries, the barriers to the use of biofuels are still substantial. The project ProBios (Promotion of Biofuels for Sustainable Development in South and South East Asia) aims at promoting biofuels in the view of sustainable development in the Southern and South eastern Asian countries. The first stage of this project concerns a study, which will provide a thorough review of the complicated and sector-overarching issue of biofuels in India and surrounding countries. This study is a joint activity of WII, ECN and CIEMAT. This report comprises a contribution to this study and describes past experiences with their policy context for a selection of EU countries, with the purpose of identifying conclusions from the European experience that may be valuable for Indian and South East Asian policy makers and other biofuels stakeholders.

## Contents

|   |    |
|---|----|
| List of tables                          | 4  |
| Summary                                 | 5  |
| 1. Introduction                         | 7  |
| 2. Brief overview of biofuels in Europe | 8  |
| 2.1 EU policy                           | 8  |
| 2.2 Current markets for biofuels        | 8  |
| 2.3 Policy targets                      | 9  |
| 2.4 Selection of countries for review   | 10 |
| 3. France                               | 12 |
| 3.1 Current and past activities         | 12 |
| 3.2 Policy goals                        | 13 |
| 3.3 Policy measures                     | 13 |
| 3.4 Conclusion                          | 14 |
| 4. Germany                              | 15 |
| 4.1 Current and past activities         | 15 |
| 4.2 Policy goals                        | 15 |
| 4.3 Policy measures                     | 16 |
| 4.4 Conclusion                          | 17 |
| 5. Spain                                | 19 |
| 5.1 Current and past activities         | 19 |
| 5.2 Policy goals                        | 19 |
| 5.3 Policy measures                     | 20 |
| 5.4 Conclusion                          | 20 |
| 6. Sweden                               | 22 |
| 6.1 Current and past activities         | 22 |
| 6.2 Policy goals                        | 23 |
| 6.3 Policy measures                     | 23 |
| 6.4 Conclusion                          | 24 |
| 7. Czech Republic                       | 25 |
| 7.1 Current and past activities         | 25 |
| 7.2 Policy goals                        | 26 |
| 7.3 Policy measures                     | 26 |
| 7.4 Conclusion                          | 27 |
| 8. Poland                               | 28 |
| 8.1 Current and past activities         | 28 |
| 8.2 Policy goals                        | 28 |
| 8.3 Policy measures                     | 30 |
| 8.4 Conclusion                          | 30 |
| 9. Slovak Republic                      | 32 |
| 9.1 Current and past activities         | 32 |
| 9.2 Policy goals                        | 32 |
| 9.3 Policy measures                     | 33 |
| 9.4 Conclusion                          | 33 |

|      |  |    |
|------|--|----|
| 10.  | Malta  | 34 |
| 10.1 | Current and past activities  | 34 |
| 10.2 | Policy goals   | 34 |
| 10.3 | Policy measures  | 35 |
| 10.4 | Conclusion   | 35 |
| 11.  | The Netherlands  | 36 |
| 11.1 | Current and past activities  | 36 |
| 11.2 | Policy goals   | 37 |
| 11.3 | Policy measures  | 37 |
| 11.4 | Conclusion   | 38 |
| 12.  | United Kingdom   | 39 |
| 12.1 | Current and past activities  | 39 |
| 12.2 | Policy goals   | 39 |
| 12.3 | Policy measures  | 40 |
| 12.4 | Conclusion   | 41 |
| 13.  | Conclusions and recommendations on European biofuel policies       | 42 |
| 13.1 | Successful market introduction: France, Germany, Spain, Sweden     | 42 |
| 13.2 | Developing a stable market: Czech Republic, Poland, Slovakia       | 43 |
| 13.3 | Starting with introduction of biofuels: Malta, the Netherlands, UK | 44 |
| 13.4 | Policy recommendations   | 44 |
|      | References   | 46 |

## List of tables

|           |  |    |
|-----------|--|----|
| Table 2.1 | <i>Production and consumption of biofuels in EU25</i>                      | 9  |
| Table 2.2 | <i>National indicative targets for biofuel consumption for EU25 (2005)</i> | 10 |

## Summary

Despite the benefits of biofuels in the fields of agriculture, security of energy supply and the environment, barriers to the use of biofuels are still substantial in India and South-East Asia. In order to get an insight in policy issues and barriers for biofuels, it is useful to draw lessons from past experiences. Several European countries have already introduced biofuels into their market before the EU Directive was issued. Some have done so successfully, while others have struggled to create a stable market. This report describes past experiences with their policy context for a selection of EU countries, with the purpose of identifying conclusions from the European experience that may be valuable for Indian and South East Asian policy makers and other parties involved in the biofuels sector.

The success stories of France, Germany, Spain and Sweden have several common factors. The most important is a fiscal support for biofuels guaranteed for a longer term. The way these countries have give the fiscal support is different, as well as the amount given. France allows the tax exemption for a limited volume of biofuels and carefully calculates the amount of tax exemption to be given, whereas Germany on the other end gives a full tax exemption for unlimited volumes of biofuels. The second factor in common is that they all in a way had an organisation firmly lobbying for the introduction of biofuels. In France and Germany this was the agricultural sector, in Spain the multinational Abengoa. Also, in all countries at least the car manufacturers or the oil companies participated, making the distribution of the biofuel possible, either as pure biofuel or a blend. In Germany, where the oil companies initially did not participate, the car manufacturers provided cars suitable for biodiesel and many independent filling stations marketed the fuel, as they had a pump available when leaded petrol became prohibited. Equally important was the political willingness to support biofuels. In Sweden and Germany left-wing/green parties' environmental motivations were important for the political support for biofuels, whereas in France and Spain support of the agricultural sector was considered important by the politicians.

The Czech Republic, Poland and Slovakia all started with the introduction of biofuels as a measure to support the agricultural sector. They have used fiscal support, but have either changed or abolished it one or several times, which is detrimental for the biofuel industry. In addition to this uncertainty of policy, much of the announced legislation has been delayed and the production and use of biofuels has also been accompanied with a lot of bureaucracy. Also, especially in Poland, clear quality standards and quality control measures have been lacking. This led to a bad image for biofuels because consumers did not have confidence in fuel quality.

Malta, the UK and the Netherlands have had a different approach to the use of biofuels than countries like France and Germany. Their view was that the extra costs for biofuels did not outweigh the benefits, keeping this option open for the long term. Still, these three countries have been actively developing their policy for biofuels with a view to the future and also under pressure of the EU Directive. Malta and the UK have chosen to make a start with a relatively small amount of biofuels, by giving only a modest tax exemption for biofuels. This is not only an effective way to make use of waste oils, but also effective in starting a biofuel market at minimal costs. The Netherlands and the UK have been actively pursuing and developing policy instruments to encourage the introduction of more cost-effective biofuels. The UK will probably not face many problems when these policies are implemented, because it already has a market for biofuels and guarantees three years of continuation of current fiscal support. In the Netherlands, uncertainty regarding future biofuel policies resulted in a poor investment climate for biofuels and fairly low confidence of market parties.

The history of biofuels policies in European countries shows that the following factors have been crucial for the introduction of biofuels in these countries:

1. Political commitment to biofuels.
2. Active market actors and/or lobbying groups initiating biofuels activities.
3. Financial compensation to bridge the financial gap between biofuels and fossil fuels.
4. End-user market for pure or blended use of biofuels.

Political commitment to biofuels for a longer period of time is crucial for creating a favourable investment climate and market conditions. This political willingness should be translated into effective biofuels promoting policies that are:

- clear,
- non-bureaucratic,
- consistent for a longer period of time,
- specific for the national context to optimally utilise the country's assets.

Market parties taking the lead and willing to invest are very important for developing a biofuels market. Which parties may be the initiators and what partnerships they could involve is strongly dependent on the local context. The establishment of consortia between fuel suppliers, biofuel producers, farmers, industrial companies, oil companies, car manufacturers, research institutes, consumer associations etc. also largely determines what biofuels will develop and to what extent.

A longer-term fiscal support system, bridging the financial gap with fossil fuels, is a very effective means for creating favourable market conditions. The exact design of the fiscal support system (types of biofuels, pure biofuels and/or biofuel blends, differentiated levels of tax exemption, etc) has also clear consequences for the development of different biofuels and the resulting biofuel mix on a national market (e.g. Germany). However, possible risks of such a system are overcompensation and state budget implications, especially if there is no limit on the biofuels volume eligible for the tax exemption. This can be prevented through monitoring and introducing a maximum level of tax exemption and/or a maximum to the biofuels volumes that can make use of the exemption (e.g. Germany, France). Moreover, a fiscal support system cannot guarantee in advance that the targets for market penetration of biofuels will be achieved. Being aware of these drawbacks of fiscal support system, some EU Member States are considering or introducing mandatory biofuels targets to fuel suppliers (e.g. Germany, the Netherlands, United Kingdom). Certification of biofuels and setting sustainability requirements is currently subject of discussion as well in various European countries.

Another important prerequisite for successful introduction of biofuels is the presence or creation of an end-user market for biofuels. This may be a large market able to use biofuel blends, such as all passenger cars running on petrol or diesel. A possibility is to use vehicle fleets that are equipped with adapted engines for the use of (almost) pure biofuels, for example captive governmental fleets ('leading by example'). In any case, end-users of biofuels need the guarantee that biofuels or blends with biofuels can be used in their cars without damage. Therefore, generally the involvement of either the car industry (use of pure biofuels) or the oil industry (use of biofuel blends) or both is necessary for reliable and effective biofuel distribution and use. Also, it requires quality standards for biofuels and biofuel blends, since their absence (e.g. Poland) or their inapplicability (e.g. Spain) is an enormous barrier to market introduction. Furthermore, such standards facilitate European biofuels trade.

## 1. Introduction

Despite the benefits of biofuels in the fields of agriculture, security of energy supply and the environment, barriers to the use of biofuels are still substantial in India and South-East Asia. There is no financing mechanism in place, the awareness in the transportation sector of this clean technology is low, and the best technologies are not always available to Indian companies. On the biomass supply side, the Indian agricultural sector has a lengthy experience with biomass production. The increasing demand for biofuels would have positive economic implications for this sector. However, there are policy barriers to be overcome as well.

The ProBios project (Promotion of Biofuels for Sustainable Development in South and South East Asia) aims at promoting biofuels in the view of sustainable development in the Southern and South eastern Asian countries. The first stage of this project concerns a study providing a thorough review of the complicated and sector-overarching issue of biofuels in India and surrounding countries. This report constitutes a contribution to this study.

In order to get an insight in policy issues and barriers for biofuels, it is useful to draw lessons from past experiences. Several European countries have already introduced biofuels into their market before the EU Directive was issued. Some have done so successfully, while others have struggled to create a stable market. This report describes past experiences with their policy context for a selection of EU countries, with the purpose of identifying conclusions from the European experience that may be valuable for Indian and South East Asian policy makers and other biofuels stakeholders.



## 2. Brief overview of biofuels in Europe

In this chapter, the countries, whose biofuels policies will be discussed in detail further in the report, are selected. To give a representative overview, countries that have successfully introduced biofuels into their market are included, as well as examples from countries that are still struggling with the introduction of biofuels and either started on their own initiative or under pressure of the EU Biofuels Directive. As a basis for this selection, first a brief overview will be given of the history of EU policy on biofuels followed by the current production and use of biofuels in the European Union, both for biodiesel and bioethanol/bio-ETBE. Then, the national indicative targets for the share of biofuels in automotive fuel consumption in 2005 will be presented for each EU Member State.

### 2.1 EU policy

During the 1990s the production and use of biofuels started in several European countries and expanded significantly. At the same time, policy at a European level was initiated, mainly from the viewpoint of security of energy supply. EU policy focussed on the possibilities for tax exemption, but the Commission failed to get its proposals approved by the Member States. Then, the 1997 White Paper ‘Energy for the future: Renewable sources of energy’ mentioned a possible 18 Mtoe<sup>1</sup> liquid biofuels in 2010. The 2000 Green Paper ‘Towards a European strategy for the security of energy supply’ was the start for a more comprehensive policy, in which biofuels should contribute to a proposed ambitious target of 20% alternative fuels (biofuels, natural gas, hydrogen) in 2020. This policy was more detailed in a proposal for a Directive in 2001, where targets for the three alternative fuels were proposed. Only the biofuel targets for 2005 (2%) and 2010 (5.75%) made it into an EU Directive in 2003, viz. the ‘Directive on the promotion of the use of biofuels or other renewable fuels for transport’ (2003/30/EC, May 8, 2003).

In 2005 it became clear that the aim of the Biofuels Directive of 2% would not be met, but would fall short at approximately 1.4%. In February 2006, the European Commission released a communication comprising an EU strategy for biofuels (COM(2006) 34 final) based on the Biomass Action Plan (COM(2005) 628 final). This biofuels strategy aims at:

- Further promotion of biofuels in the EU and developing countries.
- Preparation for large-scale use of biofuels by improving their cost-competitiveness.
- Support of the research into second-generation biofuels.
- Exploration of the opportunities for developing countries for the production of biofuel feedstocks and biofuels.

In 2006 the Commission will bring forward a report on the implementation of the Biofuels Directive with a view to a possible revision of the Directive. In order to bring the 5.75% target for 2010 closer to realisation, this report will address the issues of setting national targets for the market share of biofuels and using biofuels obligations. Moreover, only biofuels whose production in the EU and third countries complies with minimum sustainability standards will count towards the targets (European Commission, 2006).

### 2.2 Current markets for biofuels

As mentioned above, several countries had already biofuel policy prior to the introduction of the EU Directive. In Table 2.1 an overview is given of the state of affairs regarding production and consumption of biofuels in the European Union, for both biodiesel and bioethanol (numbers for

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<sup>1</sup> Tonnes of Oil Equivalent; this unit is used to compare different primary sources on energy basis.

bio-ETBE are given between brackets). Countries for which the production and/or consumption volumes are negligible as well as countries for which data could not be found are not included in the table.

Table 2.1 *Production and consumption of biofuels in EU25*

| Country         | Biodiesel          |      |                  |                   | Bioethanol (bio-ETBE)    |                |                         |                  |
|-----------------|--------------------|------|------------------|-------------------|--------------------------|----------------|-------------------------|------------------|
|                 | Production         |      | Consumption      |                   | Production               |                | Consumption             |                  |
| [x 1000 tonnes] | 2003               | 2004 | 2003             | 2004              | 2003                     | 2004           | 2003                    | 2004             |
| Austria         | 32                 | 55   |                  |                   | 0                        | 0              |                         |                  |
| Czech Republic  | 70                 | 60   | 69<br>(2002)     |                   |                          |                |                         |                  |
| Denmark         | 41                 | 70   | Neg              | Neg               |                          |                | Neg                     | Neg              |
| Finland         |                    |      | Neg              |                   | 6.3<br>(80) <sup>3</sup> |                | 6.3 <sup>2</sup><br>(0) |                  |
| France          | 357                | 348  | 321              |                   | 82<br>(164.3)            | 102<br>(170.6) | 77<br>(164)             |                  |
| Germany         | 715                | 1035 | 800              |                   | 0<br>(0)                 | 20<br>(42.5)   |                         |                  |
| Italy           | 273                | 320  |                  |                   |                          |                |                         |                  |
| Latvia          |                    |      | 2.5              |                   |                          |                |                         |                  |
| Lithuania       |                    | 5    |                  |                   | 1.9                      |                |                         |                  |
| Malta           | 0.026 <sup>4</sup> |      |                  |                   |                          |                |                         |                  |
| Poland          |                    |      |                  |                   | 60<br>(67)               | 36<br>(N/A)    |                         |                  |
| Slovakia        | 0                  | 15   | 3.07             |                   | N/A                      | N/A            | 0                       |                  |
| Spain           | 6                  | 13   | 66               |                   | 160<br>(340.8)           | 194<br>(413.2) | 152                     |                  |
| Sweden          | 1                  | 1.4  | 5.4 <sup>5</sup> | 8.7 <sup>6</sup>  | 52<br>(0)                | 52<br>(0)      | 117 <sup>7</sup>        | 224 <sup>8</sup> |
| United Kingdom  | 9                  | 9    |                  | 18.4 <sup>9</sup> |                          |                |                         |                  |

Sources: EurObserv'ER (2005), Deurwaarder (2005), European Commission (2006).

### 2.3 Policy targets

In the past decade, production and use of biofuels has increased substantially in the European Union. In the last five years the production of biofuels quadruplicated to 2.4 million tonnes in 2004 (EurObserv'ER, 2005). This growth is expected to be stimulated further by the adoption of the EU Biofuels Directive (2003/30/EC, May 8, 2003). The Directive aims at contributing to reducing CO<sub>2</sub> emissions from transport, to improving the security of energy supply of the mainly oil-based transport sector, and to creating new opportunities for sustainable rural development in the EU Member States.

According to the Directive, the EU Member States are required to guarantee that a minimum share of biofuels is sold on their national markets for transportation fuels, including inland navigation. To this end, each Member State must set national indicative targets for the share of biofuels, in line with reference percentages of the Directive, 2% substitution by biofuels in 2005,

<sup>2</sup> 7.9 million litres and an ethanol density of 0.80 kg/l.

<sup>3</sup> 108 million litres and an ETBE density of 0.74 kg/l.

<sup>4</sup> 30,000 litres and a biodiesel density of 0.88 kg/l.

<sup>5</sup> 0.2 PJ and an energy value of 37.3 MJ/kg for biodiesel.

<sup>6</sup> 0.09 TWh = 0.324 PJ and an energy value of 37.3 MJ/kg for biodiesel.

<sup>7</sup> 3.1 PJ and an energy value of 26.4 MJ/kg for biodiesel.

<sup>8</sup> 1.64 TWh = 5.9 PJ and an energy value of 26.4 MJ/kg for bioethanol.

<sup>9</sup> 21 million litres and a biodiesel density of 0.88 kg/l.

increasing to 5.75% in 2010, based on energy content. The Member States are free to choose a strategy to achieve these targets, i.e. use of biofuels in pure form (in fleets), in blends with fossil fuels, or a combination of the two. However, there is no obligation for using biofuels and Member States may deviate from the reference values in the Directive when justified, for example due to limited availability of biomass feedstock for the production of biofuels. In addition, Member States must also report to the European Commission before July 1<sup>st</sup> of each year on the measure taken to promote the use of biofuels and, if needed, the reasons why the targets have not been met. Based on these progress reports, the European Commission might revise the Biofuels Directive, and possibly establish obligatory targets for the Member States.

Table 2.2 shows the national indicative targets for the share of biofuels in transport fuel consumption, for the year 2005. The year 2010 is not included in this overview, since most Member States have not adopted a 2010 target yet.

Table 2.2 *National indicative targets for biofuel consumption for EU25 (2005)*

| Country        | 2003 Biofuel use [%] | 2005 Biofuel target [%] |
|----------------|----------------------|-------------------------|
| Austria        | 0.06                 | 2.5                     |
| Belgium        | 0                    | 2                       |
| Cyprus         | 0                    | 1                       |
| Czech Republic | 1.12                 | 3.7 (2006)              |
| Denmark        | 0                    | 0                       |
| Estonia        | 0                    | N/A                     |
| Finland        | 0.1                  | 0.1                     |
| France         | 0.68                 | 2                       |
| Germany        | 1.18                 | 2                       |
| Greece         | 0                    | 0.7                     |
| Hungary        | 0                    | 0.4-0.6                 |
| Ireland        | 0                    | 0.06                    |
| Italy          | 0.5                  | 1                       |
| Latvia         | 0.21                 | 2                       |
| Lithuania      | 0 (assumed)          | 2                       |
| Luxembourg     | 0 (assumed)          | N/A                     |
| Malta          | 0.02                 | 0.3                     |
| Netherlands    | 0.04                 | 2 (2006)                |
| Poland         | 0.49                 | 0.5                     |
| Portugal       | 0                    | 2                       |
| Slovakia       | 0.14                 | 2                       |
| Slovenia       | 0                    | N/A                     |
| Spain          | 0.76                 | 2                       |
| Sweden         | 1.33                 | 3                       |
| United Kingdom | 0.03                 | 0.3                     |

Source: European Commission (2006).

## 2.4 Selection of countries for review

Countries that have successfully introduced biofuels into their markets are Germany, France, Sweden, Spain and Italy. Germany is the leading biofuel producer in the EU and very active in promoting biofuels by excise duty reduction for an unlimited amount of biofuels. France is the second producer of both biodiesel and bioethanol (used in form of ETBE) in Europe and uses

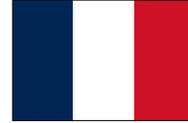
tender systems for biofuels promotion. It has ambitious plans to become Europe's leading biofuels producer. Spain is Europe's leading producer of bioethanol, also used in the form of ETBE. It is also starting biodiesel production, although issues concerning feedstock production and quality standards cause some difficulty in the Mediterranean climate. Italy is an important biodiesel producer and has a tender system similar to France. It intends to increase biofuel volumes and shift from biodiesel to bioethanol, but not much information is available. Sweden is the only country that uses large volume of bioethanol without conversion into ETBE. Sweden is also the only country that imports a large amount of the biofuels it uses.

Countries that have a history in biofuels, but have not achieved to create a stable market of considerable size are the Czech Republic, Slovakia, Poland, Austria and Latvia. The Czech Republic and Poland have considerable biofuel volumes in their markets, but both are struggling to get a stable market. In the Czech Republic biofuel producers tend to export their biofuels because of unfavourable local economic conditions and domestic bureaucracy. Poland, which has already used bioethanol and ETBE for a long time, still faces political and legislative difficulties regarding biofuels. Slovakia has had considerable biofuels production in the past and has still a large production capacity, but faces barriers in the field of costs, politics and regulations. Austria is pioneer in biodiesel technology and produces large volumes of biodiesel, which were mainly used for export. It now intends to implement the EU Directive and there is currently no reason why they should not succeed. Latvia has introduced a small share of biofuels into the market, but not much information is available.

Most other EU countries have not much of a history on biofuels. This does not make their story irrelevant. The Netherlands and the UK have been very hesitant, but not ignorant on the topic of biofuels. Both countries had concerns on costs issues as well as sustainability issues. Both have now started introducing biofuels into their markets, but in different ways. Finally, the story of Malta is considered interesting. Malta did not have a priority policy for biofuels, because as a small island state it has on many topics different approaches than the rest of Europe. This has resulted in a rapid increase of the biofuels volumes in Malta.

Thus, for the final selection of countries for review Germany, France, Spain and Sweden are chosen from the group of countries that have successfully introduced biofuels into their market. Issues that are important in Italy are probably covered by including Spain and France. From the countries that introduced biofuels, but are still busy to create a stable market the covered stories of the Czech Republic, Slovakia and Poland are expected to give an insight in legislative difficulties for the introduction biofuels. The stories of Malta, the UK and the Netherlands complete the story of biofuels in Europe.

In the next chapters, current and past activities will be described for each selected country, as well as their policy goals and measures, followed by conclusions on the key drivers for and most important barriers against the development of biofuels in these countries.



### 3. France

France is the largest country in Western Europe with an area of ca. 544,000 km<sup>2</sup> and a population of 60.7 million inhabitants. The country has only limited indigenous fossil energy sources and is therefore partly dependant on energy imports. Since the mid 1970s, France has tried to reduce this dependence as much as possible by extensive use of nuclear energy (59 power plants in 2004). Two priorities of French energy policy are improving security of energy supply and reducing green house gas (GHG) emissions. Due to extensive use of nuclear energy CO<sub>2</sub> emissions are already low in comparison with other European countries. Since the built environment and the transport sector emit relatively much CO<sub>2</sub>, the transition to using alternative energy sources specifically focuses on these sectors. Regarding renewable energy sources (RES), hydropower plays an important role in France. Biomass also has a relatively important share in French renewable energy production, for heat and electricity production as well as for the production of automotive fuels.

#### 3.1 Current and past activities

First attempts to promote biofuels use in France were made in the early 1980s. The production and use of biofuels has really started to grow only since the early 1990s, when the production and use of bioethanol and biodiesel were encouraged by an initial high excise duty exemption (TIPP, interior tax on oil products). However, as a result of this high tax exemption, the production volume of biofuels became too high. In response to this situation of overproduction, an authorised maximum quantity, which is eligible to benefit from the tax exemption, was introduced in 2002.

At present, France is one of the important players on the European markets for both bioethanol/bio-ETBE and biodiesel. Biofuels have a share of ca. 1.2% in transport fuels consumption, i.e. ca. 500,000 tonnes of biodiesel and ca. 200,000 tonnes of bioethanol (2005). Almost all bioethanol, mostly produced from beets, is converted into bio-ETBE, which is blended up to 15 vol-% into petrol. Biodiesel is mainly produced from rapeseed oil, and to a limited extent from sunflower oil. It is mostly used as a 5% blend in regular diesel. The use of biogas as transport fuel is still in the development phase with several pilot projects in captive fleets such as fleets of municipal vehicles.

Very specific for the French situation is the strong partnership of actors involved in all parts of the biofuel production chain - from farmers to oil companies - and this has been one of the important driving forces for boosting the development of bioethanol/bio-ETBE in France. Agriculture is important economically in France and it is well organised. Agricultural organisations such as the CGB (National confederation of beets producers) and AGPB (General association of cereals producers) have an important voice in the politics of fuel ethanol. They intended to take advantage of the availability of agricultural areas and of distillation capacities for the production of bioethanol, especially from beets. The agricultural lobby has been effective towards the oil companies, which were induced to participate in order to ensure their involvement in this new activity. This explains why, in 1994, the use of ethanol was given up to the benefit of ETBE production, which would involve the oil companies (TotalFinaElf). Various types of partnerships have been established between parties in the entire industrial chain, for example a joint venture between the oil company TOTAL, distilleries, and farmers. Bilateral agreements have been constituted as well, between distilleries, refineries, farmers, or bioethanol commercialisation groups. Important international players on the French bioethanol market are the Spanish group Abengoa, the largest bioethanol manufacturer in the European Union, and the Tereos Group (fusion of Union SDA and Beghin Say). The most important biodiesel manufacturers are

Europe's number one Diester Industrie with an estimated production of over 300,000 tonnes (2004) and Novaol with an estimated production of over 250,000 tonnes (2004).

### 3.2 Policy goals

In its country report (2005) France adopted national indicative biofuels targets of 2% in 2005 and 5.75% in 2010, in line with the reference values in the EU Biofuels Directive. Recently the country has set more ambitious targets for the coming years, i.e. 5.75% in 2008, 7% in 2010 and 10% in 2015, which indicates that France is planning to be two years ahead of the plan of the European Commission.

### 3.3 Policy measures

Since 1992, there has been a partial excise duty exemption for biodiesel and bio-ETBE. As of 2004, bioethanol directly blended in petrol is partly exempt from taxation. The level of the tax exemption is adjusted each year and is sufficient to bridge the financial gap between biofuels and traditional fuels. The maximum volumes, which these tax exemptions apply to, are adjusted each year as well.

In order to stimulate fuel distributors to blend biofuels in their fuels, the Finance Law 2005 has introduced an ecotax called TGAP ('General Tax on Polluting Activities') that applies to each cubic meter of fuel sold. Each fuel distributor is liable to a tax of 1.2% of the value of the product (2005). This rate corresponds to the desired percentage of biofuels to be blended into regular fuels each year and applies to bioethanol blended in petrol as well as biodiesel blended in diesel. This percentage will increase each year in order to reach 5.75% in 2010. Distributors do not have to pay TGAP if they can prove that this percentage was incorporated into the volume of fuel that they delivered.

France, besides Italy, is the only European country that makes use of a tender system, which aims at enabling international competition by letting international parties meet the established national demand for biofuels. In the French tender system, biofuel producers receive an official certificate (valid for six years) for the supply of biofuels to the French market. Foreign producers are able to benefit from the French excise duty exemption if they meet the conditions for supplying to the French market. Recently, the French government has issued several new tenders that are necessary for reaching the national biofuels targets in the coming years.

By the end of 2005, the French ministries of Agriculture and Industry, in consultation with various economic sectors, have agreed upon a Biofuels Action Plan consisting of 15 policy measures. Besides stimulating the production and use of traditional biofuels, France also aims at promoting new biofuels. Therefore, the tenders for methyl esters for 2006 and 2007 do not only apply to rapeseed methyl ester (RME) but to all oil crop-based esters (including ethyl esters). In the tender for 2008, also methyl esters derived from animal oils and biodiesel produced by synthesis processes are included.

Furthermore, France is also planning to diversify the application of bioethanol by promoting the direct blending into petrol, besides the blending of ETBE, which is now the most common application of bioethanol. As of February 2006, an industrial project will be set up in Rouen for the blending of 5% ethanol in 300,000 tonnes of petrol. Fuel prices for both ethanol and ETBE will be published to improve market transparency for both applications. As from 2006, the French government will promote the use Flexible Fuel Vehicles (FFV), especially those that are able to use regular petrol as well as E85. Interdepartmental working groups will be established in order to investigate the development perspectives of these vehicles and the implementation in captive fleets, such as municipal vehicles. Car manufacturers have been requested to introduce a number of FFV types on the market.

Moreover, for France to reach its biofuel targets for the coming years, the EU standards for automotive fuels would have to be modified in order to allow higher-volume blending of biofuels than the current 5 vol-%. Awaiting this standard, France already wants to establish a national derogation (maximum of 10 vol-% blending as from the end of 2006). The French Petrol Institute (IFP) and car manufacturers are currently testing the technical feasibility of this blending rate in order to validate it.

### 3.4 Conclusion

According to the national biofuels targets adopted recently, France is very ambitious in the biofuels field, and even wants to be ahead of the plan of the European Commission. France has been effective so far in boosting the development of biofuels, mainly due to the strong partnerships along the biofuels production chain, the availability of agricultural areas and of distillation capacities for the production of bioethanol, and the initial high tax exemption. For further developing the biofuels sector, the country has identified several strategies in the Biofuels Action Plan, 2005. However, adaptations in the agricultural sector seem to be needed in order to increase the land area dedicated to growing biofuel crops, such as rapeseed and sunflower, to achieve the national biofuels targets in the coming years.



## 4. Germany

Germany has a surface area of 357,868 square kilometres and a population of 82.5 million. Its current borders were established in 1990 with the reunion of the West and East Germany. West Germany, officially the Federal Republic of Germany, was in 1952 one of the six founders of the European Coal and Steel Community, the precursor of the European Union. Germany's main energy sources are coal, natural gas, oil and nuclear, of which only for coal (including brown coal) the major part is extracted domestically. The nuclear contribution is being phased out. The consumption of petrol and diesel for transport was 2275 PJ in 2004.

### 4.1 Current and past activities

After the introduction of biodiesel in Austria and France, in 1990 in Germany the UFOP, a union for support of oilseed- and protein plants, was founded as an alliance between farmers and oilseed breeders. In the next years, pilot production of biodiesel started and tested in car fleets. In 1995, the first production at commercial scale was started and German car manufacturers started adapting their cars for biodiesel. In 1996, the marketing of leaded petrol was prohibited and as a consequence there were free tanks available for pure biodiesel. Within a few months more than 600 public filling stations marketed pure biodiesel. None of these filling station belonged to the large oil companies, these were the independents and the ones from a German's farmers trade association and service provider. In 1997 a fuel standard for biodiesel was created.

In 1999 the German government introduced an ecotax for fossil diesel in addition to the mineral oil tax, while pure biodiesel received full tax exemption. In 2000 two new biodiesel plants were commissioned and more followed in the next years. In addition, part of the biodiesel (circa 20%) is imported from France, Austria, Denmark, Poland and Czech Republic. The sales of biodiesel increased from 130 kton in 1999 to 800 kton in 2003 and pure plant oil was used in 5 kton in 2003.

Starting January 2004, the German tax policy changed allowing full tax exemption for biofuels blended with mineral fuels. As a result, the oil companies started to blend 5% of biodiesel in mineral diesel and also ETBE entered the market. Biodiesel is also still sold in pure form at circa 1900 filling stations and it is still used in captive fleets. In 2004 the amount of biofuels sold was: 1050 kton of biodiesel, 5 kton of pure plant oil and 65 kton of bioethanol in the form of ETBE, together accounting already for 1.8% of the total transport fuel sales. In 2004, bioethanol was imported, but several plants to produce bioethanol from grains, mainly rye, were under construction. For 2005, sales of biodiesel are projected at 1650 kton, for bioethanol/ETBE it is unknown.

The new taxation rules of 2004 have triggered a wave of investment in the biodiesel industry, creating an additional 740,000 tonnes of production capacity by the end of 2005, bringing the total production capacity to around 2 million tonnes. More biodiesel plants are built, raising the capacity to 3 million tonnes of biodiesel in 2006 or 2007. Together with a capacity of 500,000 tonnes of bioethanol, the market share of biofuels in Germany could already reach the 2010 target of 5.75% biofuels in 2006 or 2007.

### 4.2 Policy goals

In 1998, a Federal Initiative for Bioenergy was launched, an organisation chaired by a member of parliament. This organisation formulated three objectives as key actions against climate change, of which one included minimum shares for renewable energy in the transport sector.

However, the main governmental driving force for biofuels has been the ministry of consumer protection, food and agriculture, from 2001 to 2005 led by Renate Künast of the Green Party. It sees biofuels and bioenergy in general as a key future technology set with the underlying idea that national welfare can be increased by internalising external environmental cost. In addition it is regarded as beneficial for the security of energy supply and it can be a means to support agricultural and economically weaker areas, such as Eastern Germany.

Germany has set a target of 2% biofuels in 2005, in line with the EU Directive. The coalition of Social Democrats and Greens, which ruled Germany from 1998 to 2005, showed clear intentions to develop the biofuel market further to higher shares of biofuels in order to strengthen the security of energy supply and reduce greenhouse gas emissions. The new government formed in 2005 of Social Democrats and Christian Democrats stated in their coalition agreement that markets for biofuels will be further developed in order to reach a 5.75% market share for biofuels for transport in Germany in 2010, also in line with the EU Directive.

### 4.3 Policy measures

Before 2004, the German law defined clearly that mineral-oil taxation applied only to mineral-oil based fuels such as petrol and diesel. Therefore, logically any fuel derived from other sources such as biodiesel was free from taxation. Thus, biofuels enjoyed full tax exemption from the very beginning, and no specific law had to be defined and negotiated. However, this applied only for biofuels that were used in pure form, i.e. not mixed with mineral-oil based fuels. This meant that in practice it could only be used for biodiesel and pure plant oil, because other for other biofuels there were no economically available technologies for the biofuels to be used in pure form.

In addition, the red-green coalition government introduced in 1999 an additional eco-tax for fossil fuels, based on the objective to reduce Greenhouse Gas emission and to transfer the related costs to the polluters. Each year from 1999 to 2003 this tax added 0.06 DM/litre (ca. 0.03 €/l) to the mineral-oil taxation, to a total amount of 0.30 DM/litre in 2003. Of course, this eco-tax does not apply to biofuels.

Under pressure of several organisations, the government changed the Mineral Oil Duty Act, effective January 2004. Now the act specifically states that biofuels and fractions of biofuels blended with fossil fuels are exempted from duty until 2009. It also states that the tax relief for biofuels must be adjusted in case of overcompensation, i.e. in case the excise duty relief causes biofuels to become much cheaper than fossil fuels. Such an adjustment is expected in 2006.

The German government has stated in their coalition agreement that they will implement obligatory targets for mixing in biofuels instead of the current system of tax relief. This statement has led to the speculation that biofuels will be taxed and has caused concern especially among vendors of pure biofuels. However, representatives from both coalition parties have said that this measure should not lead to higher prices of biofuels or petroleum fuel, whether marketed as blend or as pure fuel.

Research, development and demonstration of second-generation biofuels is supported and will continue to be supported by the new government. Capital grants of up 35% for the investment in commercial plants are also given. This is only possible for plants in certain East German regions that qualify for regional selective assistance. For other regions the EU does not allow this, because then it is regarded as market distortion.

Currently, there is the issue of alcohol legislation to be dealt with. A law that is aimed at potable ethanol production at small or medium size plants is affecting the large-scale production of bio-ethanol for transport as well. It requires a high guarantee deposit at customs for every hectolitre

alcohol produced and requires that a custom officer always accompany a plant manager when he enters his facility. This is an obstacle for bioethanol production, but the government is looking at how to overcome this.

#### 4.4 Conclusion

The introduction of biofuels in Germany can rightly be called a success story. Germany will easily comply with the 2% target from the EU Directive. But it is not an easy task to discover the critical success factors, as it seems that there are many.

Three factors were responsible for the start of the biodiesel industry:

- The vision of German farmers and breeders for the opportunity of a ‘rapeseed revolution’, made visible by the foundation of UFOP.
- The ambition of early investors to produce biodiesel at high quality.
- The (unintentional) favourable taxation laws, which levies taxes on petrol and diesel, but not on biofuels.

In the first phase (1990-1995) a biodiesel production process was developed, the biodiesel was tested in captive fleets and the first commercial biodiesel plant was built. Then, a growth of biodiesel production and sales were made possible by:

- Volkswagen and other car manufacturers giving warranties to the end-users.
- The political support because of the Green party entering the government, resulting in the eco-tax for fossil transport fuels.
- The sudden availability of fuel pumps, because leaded petrol was prohibited.

In this phase (1996-2003) the biodiesel industry expanded rapidly and a stable market was created. Besides use in fleets, more and more biodiesel was sold at petrol stations. Although the biodiesel sector expanded rapidly, there were still some concerns that the EU indicative target of 5.75% in 2010 could not be met in Germany, because:

- Biodiesel requires large amounts of land and not much more land might be available in Germany.
- Other biofuels than biodiesel could not enter the market, because the law did not allow detaxation for biofuels used in blends with mineral fuels.
- Euro IV and Euro V emission norms for cars might not be met by using pure biodiesel.

Therefore, the taxation law was changed, allowing also detaxation for biofuels blended with mineral fuels. Only now, the oil industry got involved and is selling blends with 5% biodiesel in diesel and blends with ETBE, made from bioethanol, in petrol. Also, support for research, development and demonstration of second-generation biofuels is continued in order to have BTL-fuels, which require lower amounts of land and can easily meet emission norms.

So, it seems that the strange coalition of the Greens, the agricultural community and the car manufacturers is largely responsible for the success of biofuels. In total six decisive factors were identified. Besides these, other factors have played a role, such as the active promotion of biodiesel to the public and the studies of the environmental benefits of biodiesel, both mostly done by the UFOP. Also later, other issues also played a role, including an increasing oil price, but then a firm biofuel industry was already established.

Although many regard the development of biofuels in Germany as a success, others argue that the introduction of biofuels has gone too fast. The latter prefer to wait for the second-generation biofuels, because they will be cheaper. They argue that the amount of money spent so far is too much considering the environmental benefits gained. However, others say that although the biofuels programme might have cost a lot, it also has created jobs and has, therefore, saved a sig-

nificant amount of money for the government because of saving money for allowances. And also, that the current biofuel market has paved the way for the second-generation biofuels.



## 5. Spain

Spain is situated on the Iberian Peninsula in Southwest Europe, has a surface area of 504,782 square kilometres and has 41.1 million inhabitants. It has been a member of the European Union since 1986. Approximately half of the energy used in Spain is oil based. Spain is scarce in domestic energy sources, only coal is won domestically in significant amounts. The consumption of petrol and diesel for transport was ca. 1150 PJ in 2001.

### 5.1 Current and past activities

Spain is currently the biggest bioethanol producer in the European Union. In 1995 the industrial and technical company Abengoa, now a world player in bioethanol production, and the oil companies Repsol and Cepsa created 'Eco carburantes Españoles'. This first Spanish bioethanol plant in Cartagena with a capacity of 80,000 tonnes per year started production in 2000. In 2002 a second plant was built with a capacity of 100,000 tonnes per year. Both plants have been running at full capacity. The feedstock is barley and wheat and the bioethanol is transformed with isobutylene into ETBE in three ETBE production units of Repsol and Cepsa. ETBE is used as an additive to petrol and replaces MTBE, which was used in the past. Since isobutylene is a refinery by-product, there is only a limited amount of it available. Therefore, new bioethanol plants will produce bioethanol to be used directly mixed into petrol.

The bioethanol production increases significantly with the third Spanish bioethanol plant, named *Biocarburantes de Castilla y León* on line in Salamanca. The plant is a cooperation of Abengoa and Ebro Puleva (Spain's leading food processing group) and has a capacity of 160,000 tonnes of bioethanol per year. The feedstock will be mainly barley and also some wine alcohol. In 2005 the bioethanol production and use was ca. 164,000 toe (ca. 260,000 tonnes, or 6.9 PJ).

Spain had no biodiesel production or use prior to 2003. It started with a pilot project using waste cooking oils, which resulted in a production of 6,000 tonnes of biodiesel in 2003. In 2004 several biodiesel plants were operational and the biodiesel production was 13,000 tonnes, but the production capacity was already circa 80,000 tonnes. More biodiesel plants were under construction with a combined capacity of 200,000-250,000 tonnes per year. In 2005, the biodiesel use ca. 135,000 toe (ca. 150,000 tonnes, or 5.7 PJ). Total amount of biofuels used in 2005 was 12.5 PJ, circa 1.1% of total petrol and diesel use.

### 5.2 Policy goals

The original Spanish policy on biofuels, set for the period 2000-2010, aimed at 500,000 tonnes oil equivalent of biofuels in 2010, which is approximately 1.7% of total transport energy use. An important driver for this policy was its foreseen creation of jobs.

After the adoption of the EU Biofuel Directive, Spain has notified the Commission that it has set its national indicative target at 2% for 2005. Also in line with the Directive, in August 2005 adopted 'Plan for Renewable Energy 2005-2010' the amount of biofuels will rise to 2,200 ktoe in 2010, approximately 6% of the foreseen amount of transport fuels used in Spain in 2010. Besides the current feedstocks of barley, wine alcohol and waste vegetable oil, it is foreseen that virgin plant oils could account for approximately half of the target for 2010. Since these are hardly used now, mainly because of their high local production costs, measures are proposed to promote virgin plant oil production.

### 5.3 Policy measures

Under a 1994 law bioethanol projects could be allowed a tax exemption based on the fact that they constitute “innovative projects for technological development of less contaminating products”. The two commercial bioethanol plants received this tax exemption. However, under EU law at the time, Spain used a very liberal interpretation of the Mineral Oil Directive. Under this Directive, tax exemptions and other financial support could only be given to ‘pilot projects’, i.e. projects that demonstrate or test new fuels, new distribution and new uses of fuels.

By a December 2002 change in the law on Tax, Administrative and Social Measures, all biofuel pilot plants receive a full detaxation for five years and all industrial plants receive a full detaxation until at least December 2012. This also applies to the amount of biofuels used in mixes with fossil fuels. However, partial taxation maybe applied to biofuels if the comparative trend in the production costs of petroleum products and biofuels so warrants.

Spain has also transposed the EU Directive into national legislation already in 2003. In fact, in March 2005, Spain and Lithuania were the only two countries that the Commission did not consider to take action against. Besides transposing the EU Directive they had both communicated everything required to the Commission and adopted the reference target of 2%.

To reach the 2010 target, a significant growth of biofuel use is required. Several barriers should be overcome to achieve this growth of biofuel use:

- High biofuel cost to consumers compared to petroleum based fuels.
- CAP reform may limit the supply of primary agricultural inputs.
- Disadvantaged cereals and oilseed production compared to Northern Europe.
- Preparation for the general distribution channels of fuels is necessary.
- Car manufacturer’ engine warranties are necessary.
- High market price of oils for food use, higher than what can be paid for biofuel use.

The following measures are proposed in the ‘Plan for Renewable Energy 2005-2010’ to overcome these barriers:

- A ten-year guarantee of fiscal support for commercial biofuel plants.
- Develop all available possibilities within the new CAP, in particular the ones that refer to European and national assistance for the production of biofuel crops.
- Development and selection of new oilseed types, adapted to the agricultural characteristics of Spain.
- Development of logistics, both for feedstock collection and biofuel distribution.
- Technical developments for the mixture of biofuels and conventional fuels.
- Certification and monitoring of biofuel quality standards.
- Develop a normative that forces the use of biofuels.

Further, research into cultivation and processing of lignocellulosic crops will also be stimulated.

### 5.4 Conclusion

The main elements, which explain the development of bioethanol in Spain are:

- The leading role played by a private company (Abengoa) specialized in energy and environment projects associated with oil companies. This resulted in the choice for ETBE, so that oil companies could play a major industrial role and in the creation of a distillery in which they are shareholders.
- The high level of tax exemption (100%), granted by the public authorities motivated by environmental considerations.
- The regional policy of the autonomous regions, motivated by the importance of the agricultural sector.

- The Common Agricultural Policy, under which the production of barley benefits from set aside indemnities.

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

Biodiesel production started much later than bioethanol production, because:

- There was not an influential actor (like Abengoa) pursuing the introduction of biodiesel in Spain.
- The taxation on diesel is not as high as on petrol (and also lower than the diesel tax in most other European countries) and the biodiesel production is generally too expensive in Spain, even with full detaxation.
- The quality standard for biodiesel is based on rapeseed feedstock, the main feedstock used in Europe. However, the climate in Spain is not suitable for cultivation of rapeseed. It is suitable for sunflower, but with sunflower it is more difficult to meet the biodiesel quality standard.

Biodiesel is currently produced mainly from cheap waste vegetable oil streams. However, for 2010 it is foreseen that biodiesel from local virgin plant oils will make an important contribution. This requires a significant amount of agricultural land and a careful selection of an oil seed crop suitable for the Spanish climate. Import of biofuels is not mentioned in Spanish policy documents concerning biofuels.



## 6. Sweden

Sweden is a country in Northern Europe with 9 million inhabitants. It has a surface of 450,000 km<sup>2</sup>, of which more than half consists of forests. Sweden is richly endowed with renewable energy sources, including large resources of bioenergy, hydropower and wind power. Broadly speaking, Sweden's energy supply mix consists of somewhat more than 40% oil, nearly as much renewable energy and 20% nuclear power. Swedish energy and environmental policy strongly focuses on boosting the share of renewable energy in the total primary energy mix for reasons of security of energy supply and reduction of greenhouse gas emissions. The use of bioenergy as a substitute for fossil fuels has especially increased in district heating systems and manufacturing processes.

### 6.1 Current and past activities

After the Second World War, bioethanol was produced for the first time for the automotive fuels market in Sweden again in the middle of the 1980s. Farmers (Swedish Farmers Organisation, SLR), with government financial support, engaged in a pilot wheat-based ethanol plant, using a new technology developed by a Swedish engineering company. The ethanol was sold by a Swedish oil company as a low-volume blend with petrol and sold in the Stockholm area for a few years. In the 1990s, the possibilities of an outlet for farm crops into the transport sector as well as the environmental concern created a political support for ethanol produced from grains, however, the ambition of producing ethanol from wood in the longer term already existed at that time. During the 1990s, the use of ethanol as an alternative fuel grew moderately. In this period, several public transportation companies initiated test projects with ethanol driven buses. During the second half of the 1990s, Flexible Fuel Vehicles were introduced as well.

In Sweden, the promotion of biofuels is now a component of the government's strategy of long-term sustainable development, including the promotion of renewable energy sources and cleaner transport. In 2001, the country has started a strategy for switching to green taxes. Under this strategy, increased taxes on energy and environmentally harmful emissions are offset by reduced taxes on labour. One year later, the tax strategy for alternative fuels was introduced, which made tax relief possible either for pilot projects, which qualified for full exemption from excise duties, or in the form of a general exemption from CO<sub>2</sub> tax for CO<sub>2</sub> neutral fuels. Since 2004, CO<sub>2</sub> neutral fuels are exempt from both CO<sub>2</sub> tax and energy tax. Besides specific policies aiming at boosting the use of bioenergy in various sectors, such as transport, the Swedish government has also actively promoted the introduction of environmentally friendly vehicles, such as those running on biofuels.

The past five years, there has been a considerable growth in the use of biofuels in Sweden, especially for bioethanol, which accounts for almost 90% of biofuel use (5.9 PJ in 2004). Ethanol is produced from grain and from by-products of paper pulp production. Biodiesel/RME (0.3 PJ in 2004) and biogas (0.5 PJ in 2004) are also widely used in the Swedish transport sector. This brings the total biofuels share in total transport fuel use to 2.3% in 2004, calculated on the basis of energy content. In 2003, this share was already 1.3%, but the use of bioethanol and RME almost doubled in the period 2003-2004, which is also true for the period 2002-2003.

Unlike France and Spain, Sweden does not convert bioethanol into bio-ETBE in order to distribute it. In Sweden, about 85% of all fuel bioethanol is used in low-level blends, i.e. petrol with a 5% bioethanol content. At the end of 2003, about half of all 95-octane petrol contained 5% bioethanol. About 15% of fuel bioethanol is used in a pure or an almost pure form (E85). The number of bioethanol filling stations is growing rapidly. In 2004, 29 public refuelling stations for ethanol E85 came into operation, bringing the total to 131. In April 2005, the number

of Flexible Fuel Vehicles, which can run on either petrol or E85, amounted to 15,000 cars, an increase of 67% compared with 2003. The number of light and heavy vehicles able to run on biogas/natural gas has also increased substantially. At present, around 25% of the Swedish buses are running on biofuels.

Recently import of bioethanol has strongly increased and now accounts for most of the bioethanol used as fuel in Sweden. In 2004, four times more bioethanol was imported than produced domestically. It is imported from Brazil and other South American countries as well as France, Spain and Italy. This is because the domestic production capacity is not sufficient to meet the increasing biofuel demand and because imported ethanol is usually much cheaper compared to domestic production, especially sugar-cane ethanol from Brazil.

## 6.2 Policy goals

The use of biofuels in Sweden is rising, which is mainly the result of increased imports of bioethanol, and, in 2004, the country has already exceeded the 2% reference value recommended by the European Union for 2005. Therefore, Sweden has established a target for 2005 that is higher than the indicative target of the Directive, i.e. 3% of total petrol and diesel consumption. However, there is uncertainty as to what will happen to imports of bioethanol and RME if demand from other countries increases in the future, which may lead to higher biofuel prices. A national target of 5.75% for 2010 - in accordance with the reference value of the European Commission - has been announced by the Swedish government in its policy plan 'Svenska miljömål - ett gemensamt uppdrag' (Swedish environmental goals - a joint assignment). This plan states 15 environmental goals, including 'clean air', and one of the strategies to achieve this is promoting the use of biofuels.

## 6.3 Policy measures

In 2004, the tax strategy for alternative fuels was changed so that from 2004 to 2009 CO<sub>2</sub>-neutral fuels are exempt from both CO<sub>2</sub> tax and energy tax. However, changes to avoid over-compensation can be made at any time, as is required by the European Commission, and, for the same reason, possibilities of replacing the tax relief by other incentive systems, such as a quota obligation system combined with tradable certificates, are currently being studied. In addition, from 2002 to 2008 it is possible to obtain a tax reduction for the purchase of environmentally friendly company cars. In 2005, at least 25% of all newly purchased government vehicles had to be environmentally sound, i.e. (partly) fuelled by biogas, bioethanol or electricity. This target has been increased to 35% for 2006. Another means to reduce environmental impact of transport is a trial environment/congestion charge in the City of Stockholm. Environmentally friendly vehicles, running on alternative fuels, will be exempt from this charge.

In addition to tax strategies to support the use of biofuels in transport, several implementation issues are currently being studied and debated. For example, the Swedish Road Administration (Vägverket) was asked to review the possibilities for all diesel fuel to contain up to 5% RME and to investigate the environmental and health impacts of the vehicle emissions of such a biofuel blend. Besides this, the SRA also examined the requirements for a Swedish regulation allowing the retrofitting of private cars for alternative fuels, without conflicting with the EU car producer responsibility for cleaner emissions. Furthermore, Sweden is an advocate of increasing the low admixture level for ethanol in petrol to 10% so that the biofuel targets can be achieved more cost-effectively. At present, the European Commission is reviewing the fuel specifications laid down on the Directive on fuel quality, which now prohibits the admixture of more than 5 vol-% of ethanol in petrol. In addition, the Swedish government would have to increase the maximum blending rate of RME in diesel from 2% to 5%.

Besides financially supporting and improving the implementation of biofuels, the Swedish government also supports research, development and demonstration measures for developing more energy-efficient and more cost-effective biofuel production processes, such as a pilot plant for studying bioethanol from forest raw materials, which was inaugurated in May 2004. The plant was designed to verify and optimise the chosen technology and to provide a basis for a processing technology for the production of ethanol and lignin, which is commercially viable for a demonstration plant.

## 6.4 Conclusion

For Sweden, environmental reasons are an important driving force for boosting the use of biofuels in transport. The use of alternative fuels and cleaner technologies in transport is incorporated in a general long-term strategy towards sustainable development. The stakeholders for biofuels in Sweden are planning to increase domestic production capacity for mainly biogas and RME, since bioethanol can be imported at a lower cost compared to domestic production. Sweden is the only country that is importing biofuels on a large scale, and these imports largely explain the strong growth of biofuel use, especially bioethanol, in the past years. There is a risk of increasing biofuel prices, if other countries are to cover their increasing biofuel demand (partly) by imports as well. In the longer term, Sweden hopes to produce more biofuels domestically by producing second-generation biofuels based on lignocellulosic biomass from short rotation forestry.



## 7. Czech Republic

The Czech Republic was founded as an independent country on January 1<sup>st</sup> 1993, after the split of the former Czech and Slovak Federal Republic. The Czech Republic has ca. 10 million inhabitants and joined the European Union on May 1<sup>st</sup>, 2004. In the country there is a large availability of agricultural land and woodland. Biomass is still traditional solid fuel both in household heating systems mainly in rural areas and in district heating systems. Biomass is also used in electricity production and in the transport sector. In 2004, the total transport fuel use (petrol and diesel) amounted to ca. 240 PJ. In Czech Republic there is strong political support for the development of renewable energy in various sectors. The government aims at increasing the share of renewable energy in total primary energy use to 4-6% in 2010 and 8% in 2020. Biomass is expected to play the most important role in the growth of renewables.

### 7.1 Current and past activities

The Czech Republic has a long tradition in production and use of biofuels in transport, but only in the field of biodiesel, not bioethanol. In the early 1990s the Czech Ministry of Agriculture launched the 'Oleoprogram' (Oil programme) to promote the development of the production of rapeseed oil methyl esters (RME) and its use as an automotive fuel. In the years 1992-1995, financial aid was allocated to producers of RME in the form of subsidised loans without or with only very little interests to support the build-up of manufacturing capacity. Due to these grants, RME production plants with an annual capacity of ca. 60,000 tonnes were successfully established within a very short time. Additional public resources have been made available and are being dedicated exclusively to promoting RME and biodiesel production. A biodiesel blend, i.e. a blend of diesel and RME containing 31% RME by volume, is produced for the domestic market from 1997 onwards. This product can be used in all diesel engines and is distributed separately from conventional diesel at refuelling stations. At present there are 14 RME producers in the Czech Republic, which have a total production capacity of approximately 150,000 tonnes of RME annually.

Since 2001, the legislative framework for support of the production and use of biodiesel has undergone some changes. Until this year, the higher production costs of biodiesel components were offset by the payment of direct subsidies to manufacturers of RME and fuel blends. From 2001 to April 2004, compensation was granted in the form of price rebates for oil rape grown on set-aside land. A central role was dedicated to the State Agricultural Intervention Fund (Státní zemědělský intervenční fond - SZIF), which purchased rapeseed cultivated on set-aside land, ensured its storage, and sold it to RME producers for a defined price, which ensured the competitiveness of the biodiesel blend (31 vol-% RME). The subsidy for the production of RME was calculated in such a way that it enabled the supply of biodiesel to the fuel market at a 10% lower fuel price as compared to fossil diesel. In addition, RME producers received direct support for processing rapeseed oil for non-food uses. Moreover, distributors received subsidies for the blending of RME, and sellers received tax exemptions for the sale of biodiesel. In the period 2001-2004, the production level of RME was mostly in the range of range of 60,000-70,000 tonnes per year. However, in 2001, the production level was exceptionally low, i.e. only 39,600 tonnes of RME.

After the accession of the Czech Republic to the European Union, the country was granted a transitional period for the state aid for domestic RME production until 2006. A new system of subsidies was introduced in 2004, which limits subsidised production to 100,000 tonnes of RME in 2005. The level of subsidy is determined based on world fuel prices. As from July 2004, there is a lower excise duty on blended fuel/biodiesel, i.e. the RME incorporated in fuel blends carries zero excise duty. At present, the administrative procedures for biofuels producers to claim ex-

cise duty back from the financial office for their sales of RME are complicated, bureaucratic and time-consuming. For this reason, exporting biofuels has become more attractive to biofuel producers. In 1999 and 2000 Czech Republic was still a net importer of RME and biodiesel, but as from 2001, exports increased dramatically, with a net export peak in 2001 of ca. 68,000 tonnes of biodiesel and RME, mainly to Germany.

In contrast to the situation of biodiesel, the production of bioethanol/ETBE from grain for use as automotive fuel has so far been limited to pilot projects to test its potential market opportunities. This is in spite of the fact that financial aid and legislative conditions have been in place since the late 1990s to enable and promote the production of bioethanol for alcohol fuel blends in order to reduce transport emissions and pollution and to utilise agricultural surpluses. Currently the whole production of bioethanol takes place in facilities dedicated to the food and drinks industry. In order to avoid frauds in alcohol/bioethanol production for use in the transport sector, the current Czech legislation requires special facilities to be built dedicated to the production of bioethanol for transport purposes to avoid its misuse.

## 7.2 Policy goals

In the frame of the EU Biofuels Directive, the Czech government published a country report in 2004 indicating the level of their indicative targets and the motivation for them. In this report, the country set a very high preliminary target of 3.7% for the consumption of biofuels in 2006, which exceeds the reference value set by the European Commission (2% in 2005). For 2010, the indicative target is set at 4.5%<sup>10</sup>, which is below the reference value for that year, i.e. 5.75%. Main motivations for this are the accession to the European Union and the creation of new opportunities in rural areas (non-food use of agricultural land) and of new jobs as a result of increased local biofuel production. Other reasons mentioned are increasing energy self-sufficiency and improving the environment.

The country report stated that the preliminary targets would become definitive in the course of 2005, since they depend on the possibilities of the State budget and on agricultural production. However, in the second country report, published in 2005, the Czech government lowered its ambitions for the first phase (2006). In the first country report, a very strong growth of bioethanol was anticipated in order to achieve the target, i.e. increasing the production from zero in 2004 to 174,000 tonnes in 2006. In the second country report, this expectation was lowered to a more realistic level of 20,000 tonnes of bioethanol in 2006.

According to the second country report, the shares based on energy content of biodiesel and bioethanol would be 2.32% and 0.58% in 2006, respectively. This would bring the biofuels target for the Czech Republic for 2006 to ca. 1.7% in total diesel and petrol sales, which is below the reference value indicated by the European Commission for 2005. However, in 2010, the expected share of biofuels of ca. 5.6% in total diesel and petrol sales<sup>11</sup>, mainly the result of an enormous growth in bioethanol production between 2006 and 2010, would be close to the reference value of 5.75% for that year.

## 7.3 Policy measures

In the Czech Republic, several policy measures are currently in place transposing the EU Biofuels Directive into national legislation. First, the Decree No 229/2004 Coll. specifies which bio-

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<sup>10</sup> These targets are composed from separate targets for RME and bioethanol. For 2006, the share of RME in diesel sales is set at 2.75% and the share of bioethanol in petrol sales is set at 5.2%. For 2010, the share of RME in diesel sales is set at 3.1% and the share of bioethanol in petrol sales is set at 6.6%.

<sup>11</sup> The second country report mentions separate biofuel targets based on energy content for 2010, i.e. 5.47% for biodiesel in total diesel sales and 5.78% for bioethanol in total petrol sales.

fuels may be supplied to the Czech market and the forms and quality in which they are to be supplied. Second, the Act No 86/2002 Coll. (on protection of the air) lays down an obligation for the producers, importers and distributors to place on the fuel market a minimum amount of biofuels or other fuels produced from renewable resources. Third, the Government Order No 66/2005 Coll. establishes the system for placing biofuels into free circulation on the market in the Czech Republic. It takes over the indicative reference values set by the European Commission and translates them into national production targets.

#### *RME/biodiesel*

The compensation of the higher production costs and lower energy efficiency of biodiesel comprises a subsidy for non-food use of rapeseed for the production of RME (Government Order No 148/2005) and a reduced rate of excise duty (Act No 353/2003). In the biodiesel blend containing 31 vol-% RME, the RME incorporated in the blend is free of excise duty. Besides this blend, which has been on the Czech fuel market for many years, market conditions for placing pure RME on the market have been created, and this fuel has been introduced recently. The quality of Czech RME is regularly monitored by the aid provider SZIF according to the European standard EN 14214 (for fatty acid methyl ester, FAME), which replaced the Czech standard ČSN 656507/Z1 after EU accession. The quality of the 31 vol-% RME/biodiesel blend is guaranteed according to the Czech standard ČSN 656508. The Czech government is drafting new legislation and setting up a new system which will make the use of biofuels in transport possible as of 2007, after the transitional period for the present support system for RME will end. As of January 1<sup>st</sup> 2007, it is expected that the partial refund of excise duty - under considerably simplified conditions - will enter into force for 5 vol-% RME biodiesel blends.

#### *Bioethanol/bio-ETBE*

Wider use of bioethanol is planned from 2007, when new bioethanol production facilities and distribution systems should become operational. For bioethanol, a compensatory system has been created as well, which is currently being notified by the European Commission. First the use of bio-ETBE blended up to 15-vol% in petrol, following the European standard En 228, is envisaged. However, there are no production facilities available yet, mainly due to technical problems. Bioethanol also likely to be marketed in direct form, i.e. up to 5 vol-% blended in petrol. In addition to the above market opportunities for bioethanol, it is expected that fuels with high bioethanol content will also be used, such as E85 (containing 85% bioethanol, 10% petrol and 5% additives) and E95 (for fuel containing 95% bioethanol and 5% additives). However, the extent to which such fuels are used depends on the number of vehicles adapted to run on them and on the network for distributing these fuels.

## 7.4 Conclusion

The Czech Republic is very ambitious in the field of biofuels, mainly motivated by the rural development resulting from local biofuels production. The past 15 years, the country has been very successful in stimulating biodiesel production and use through state aid, but this financial support system is gradually being changed after EU accession. Legislative and technical issues might cause the country to fail in reaching its biofuel targets. There is an increasing tendency in rapeseed production and processing into RME but this extension very much depends on the final form of the new Czech biofuels legislation and on its implementation. Currently, there is a trend towards exporting biofuels. This development is undesirable since it only partly contributes to the Czech objectives for producing and using biofuels, and, moreover, biofuels producers are now profiting from the billions invested by the state since 1992 into boosting domestic biofuels production to succeed on foreign fuel markets. In order to change this trend, the new Czech legislation to be introduced should be less complicated and bureaucratic, for example by implementing a simpler system for refund of excise duty, making the domestic market more attractive to Czech biofuel producers.

## 8. Poland



Poland is situated in Central Europe, has a surface area of 312,683 square kilometres of which approximately 60% is agricultural land and 30% forests. Poland has 38.6 million inhabitants and it has been a member of the European Union since 2004. More than half of the energy used in Poland comes from coal. Poland has the world's fifth largest proven reserves of hard and brown coal and it is a net exporter of coal. It also has some domestic natural gas resources. The consumption of petrol and diesel for transport was 318 PJ in 2001.

### 8.1 Current and past activities

Poland is the only country among the new EU Member States to have developed the biofuel sector in a significant way. In the beginning of the 1990s a huge overproduction of alcohol, resulted from a necessary surplus production of cereals, potatoes and beet molasses, made Poland decide to produce petrol with bioethanol as additive. A new fuel standard in 1992 made a wider usage of bioethanol possible. A specific tax exemption from 1993 onwards gave a further boost to the use of bioethanol, either mixed in as 5% bioethanol in petrol or mixed as the bioethanol-derivate ETBE. The use of bioethanol was 27 million litres in 1994 and rose to 110 million litres in 1997, mainly in the form of ETBE, but also bioethanol. Petrol with ETBE or bioethanol was also replacing the priority used leaded petrol. After 1997 the bioethanol has declined to 49 million litres in 2004. However, there are currently 20 Polish producers of dehydrated bioethanol with a combined production capacity of approximately 500 million litres of bioethanol. Also, there are ca. 100 small agricultural distilleries. The Polish oil company Orlen has a refinery with an ETBE production capacity of 100,000 t on ETBE per year.

In the period 1994-1997, a research project testing biodiesel from Polish rapeseed was carried out, which led to a proposal for a national biodiesel standard. This standard was never adopted, but the draft enabled potential producers of biofuel to develop the technology needed to produce fuel of the appropriate quality. At the same time a Polish company undertook the production and sale of diesel with biodiesel. However, this was discontinued after a few months, because the production proved unprofitable. The excise duty reliefs at the time did not apply to biodiesel/diesel blends. However, pure biodiesel was not subject to excise duty under the tax regulations then in force, but nevertheless, it was not economically attractive because its price was two to three times higher than that of fully taxed diesel. In the period 2000-2004 several research programmes were done in the field of biodiesel, mostly on high blends (20-30%) of biodiesel in city buses and non-road applications. From December 2004 the Trzebinia refinery started commissioning a biodiesel production plant with a capacity of 100,000 tonnes per year.

The total biofuel production in 2004 was 1 PJ, approximately 0.3% of total petrol and diesel consumption, compared to 0.6% in 2002. Poland is the only EU country where biofuel production decreased sharply. This can be explained by several delays of a law that should promote biofuels and fierce political debate about this law.

### 8.2 Policy goals

Because of the political and economic transformation processes started after the fall of the Berlin wall, Poland's Greenhouse gas emissions have decreased by 30% over the period of 1988-2002. Poland has even a surplus of CO<sub>2</sub> credits available for sale under the Kyoto protocol. Therefore, environmental reasons to use biofuels are not strong in Poland. However, biofuels, especially bioethanol and biodiesel, are recognised as a chance for restructuring the Polish agri-

cultural sector. In addition, the extent of heavy-metal contaminated land is considered as a possible place for energy crops.

In August 2001 the Polish parliament developed a strategy for the development of renewable energy that included the development of biofuels by the year 2010. In this strategy the share of renewable energy source is to be increased to 7.5% in 2010 and 14% in 2020. Special attention was paid to legal and economic aspects of the use of biofuels in Poland.

In 2002, on the initiative of the co-ruling PSL, the Polish Peasant Party with much support the agricultural sector, the agricultural ministry prepared a bill for the stimulation of biofuels. The bill would improve energy security and create 100,000 jobs. The latter was the main argument for the bill, because the level of unemployment in Poland was around 18%. However, the proposed bill became the subject of a huge political debate in 2002 and 2003. The proposed bill included an obliged minimum admixture of 4.5% of bioethanol (or in the form of ETBE) into petrol starting in July 2003 and increased to 5% from January 2006. The biofuel components in these mixtures would be exempted from excise tax. It allowed only biofuels produced from Polish feedstock to be used and would set a minimum price for these biofuel crops.

The Polish government faced open resistance from oil companies, car producers, consumers and even from the Ministry of Finance. The opponents of the law included the Polish oil company Orlen, which already added bioethanol and ETBE to petrol. Their arguments against they law were:

- The high obligatory minimum biofuel level.
- The fact that only in Poland produced feedstock material was allowed for the bill and that was against EU regulation and also that this clause would invalidate the law at the moment of the EU accession.
- The controversial government prerogative to set a minimum price for crops used in biofuels.
- There were no clear standards for biofuels in Poland and many vehicles on the road would not be able to drive on high blends of biofuels mixed into diesel or petrol.
- A decrease in budget revenues coming from excise and VAT taxes.
- The argument that mainly a small number of large producers and owners of distilleries would profit from the bill and that these were often linked to the bill's champions, the PSL party.
- The denied right to choose their fuel for the consumers.

The bill was approved by parliament, but it was vetoed off by the President in January 2003 with the arguments that, after consultation of experts, he had doubts of technical character and said it has legislative faults. He urged the parliament to adopt a few changes to the bill such as gradual introduction of biofuels, offering consumers the right of choice, and creation of effective inspection systems. This decision caused farmers to start roadblocks and the PSL-party called to override the presidential veto and threatened to oppose the EU accession in the upcoming referendum if a biofuel law was not in place before the accession.

Eventually, changes were made to the draft bill, which now required 3.5% of bioethanol (or in the form of ETBE) in petrol from October 2003, 4-5% from January 2004, and for each following year the Polish Council of Ministers will determine the percentage. The minimum share of biodiesel in diesel will be set at a later date. The feedstocks for the biofuels still had to be from Polish origin, but only until Poland joined the EU. The president approved the bill in as late as November 2003 and it should have entered in force in January 2004. However, experts still argued that 'the law is not working' and the Polish Constitutional Court did not ratify it. The Ministry of Agriculture and Ministry of Economy were working on changes to the law in 2004, but in June 2005 it was still in the revision phase. Expected changes concern the minimal share of biofuels, laboratories testing quality of biofuels and mixtures, monitoring and quality control and indication at the fuel pumps what amount of biofuels is mixed into the fuel.

In the official reports to the European Commission Poland has laid down its indicative targets for biofuel use at 0.5% for 2005, 1.5% for 2006 and 5.75% for 2010. Poland's motivation for the fairly low 2005 target is that it does not have more budget for biofuels and that the target has to be realistic for producers of biofuels and petroleum fuels. The target for 2006 is motivated with the same reasons, but it can be higher than the one for 2005, because it is expected that before 2006 the quality standard for the use of biodiesel and for the use of biofuels in blends higher than 5% will be ready.

### 8.3 Policy measures

The Polish government is of the opinion that the key strategy of promoting the use of biofuels is to select an appropriate level of excise duty, in accordance with technological progress in the field of vehicle and fuel production. The government of Poland find it essential that such measures are constantly monitored, as tax exemptions have to be adapted to changing circumstances. A system of duty reliefs and exemptions has been operational in Poland since 1993, but initially this only applied to the admixture of bioethanol or ETBE to petrol. The amount of duty relief was determined on a yearly basis after approval of the annual budget.

From 1997 there was an excise duty relief of 91 PLZ per 1000 litre (ca. 0.03 €/l) for petrol containing 4.5% to 5% bioethanol and 61 PLZ per 1000 litre (ca. 0.02 €/l) for petrol containing 3% of ETBE. In May 2004 the tax relief system has undergone modifications bringing it into line with the European Union legislation and the new Polish biofuels law. Biodiesel is now included. There are now three different excise duty relieves, one for blends of 2-5% biofuels in petrol or diesel, one for blends of 5-10% and one for higher blends or pure biofuels. For the first time, this allows blends of biofuels as low as 2% to qualify for duty exemption, but the structure of the three different excise duty relieves make higher blends more attractive from an economic point of view.

However, with these duty exemptions in place, it is still not possible to bring biodiesel or biofuels in blends higher than 5% into the market, because the necessary laws on quality requirements and analysis methods are not in place yet. These are expected to come in force by the end of 2005 or in 2006.

### 8.4 Conclusion

The driving forces for the start of the use of bioethanol in Poland were:

- surplus of agricultural production,
- strong agriculture and agro-industry lobby.

In a later stage, some other factors should have influenced the biofuel use in Poland positively:

- Necessary compliance with the EU Biofuel Directive as part of the acquis of the EU accession.
- Increase of oil price and the consequent awareness of the need for more security of energy supply.
- The huge amount of unexploited bio-resources, available at lower cost than in Western Europe.

However, the use biofuels has declined in Poland over the past few years, because of:

- (Still) Unstable legal framework and taxation and slow changes to it. Poland is known to have one of the most bureaucratic systems in Europe.
- Limited financial government resources to promote biofuel.

- The lack of clear quality standards and analysis and control methods for most biofuels and blends of biofuels and petroleum fuels.
- A bad image of biofuels in society, based on the supposed poor quality of biofuels and incompatibility with car engines, which was advocated widely by the opponents of the biofuels law during 2002 and 2003.

All in all, it is clear that Poland wants to stimulate the use of biofuels, because of the boost it will give to the agricultural sector. However, limited government budget for biofuels, a heated political discussion and the Polish bureaucracy have so far delayed a successful large-scale introduction of biofuels. A comprehensive biofuels law was finally adopted in 2003, but the necessary tax exemptions, quality standards, controlling mechanisms etc. were not ready for it yet.



## 9. Slovak Republic

The Slovak Republic was founded as an independent country on January 1<sup>st</sup>, 1993, after the split of the former Czech and Slovak Federal Republic. It is a small Central European country with ca. 5.4 million inhabitants. The cultural, industrial and economic centre of the country is the capital city Bratislava. The Slovak Republic joined the European Union on May 1<sup>st</sup>, 2004. Like most other new Member States, agriculture is a very important economic sector in Slovakia. Because of its poor domestic energy resource base, the country imports most of its primary energy supply. The transport fuel demand amounted to ca. 77 PJ in 2003. One of the priorities of the Slovak Energy Policy, adopted in January 2000, is to increase the utilisation of the domestic potential of renewable energy sources.

### 9.1 Current and past activities

Although Slovakia has abundant biomass resources available, a clear market for bioenergy is still lacking, i.e. at present biomass only provides 0.2% of energy in Slovakia. The available biomass resources consist mainly of industrial wood residues and forestry wood residues (north/central), straw and other agricultural residues (south-west/east), rapeseed, and wet biomass like animal manure and sewage sludge.

Although Slovakia has so far under-utilised their biomass potential, the country does have experience in producing biofuels. In the period 2001-2003 Slovakia had a biodiesel production capacity of 62,000 tonnes per year. In 2001, 30,290 tonnes of biodiesel were actually produced and used in Slovakia, i.e. a share of 1.6% in total transport fuel consumption. In 2002, the production of biodiesel dramatically decreased to only 6,267 tonnes, of which approximately a quarter was exported. In 2003, even less biodiesel was produced, only 3,573 tonnes. This strong decrease of biodiesel production was due to the abolition of state subsidies, which caused many companies that originally produced biofuels to restrain their production and either stop the construction of new capacities or convert their business activities. Data on bioethanol production and consumption are not known but there is only a very limited volume of domestic ethanol for the production of ETBE.

### 9.2 Policy goals

For reasons of reduction of energy import dependency and utilisation of the large available area of woodland, development of the biomass sector is one of the main priorities of the Slovak renewable energy policy. This policy aims at reaching a renewables share of 4% in total primary energy supply in 2005.

Slovakia has set national indicative targets in line with the reference values of 2% for 2005 and 5.75% for 2010 as well as targets for the years in-between. For achieving the 2% target, minimum volumes of biofuels to be used are 46,922 tonnes of biodiesel or 63,500 tonnes of bioethanol, blended in diesel or petrol, respectively. In order to reach the 5.75% target, at least 151,762 tonnes of biodiesel or 205,384 tonnes of bioethanol should be consumed, by the end of 2010.

Although Slovakia seems to have accepted the reference values set by the European Commission, 'the quantification of national targets in 2005 and 2010 will be conditioned by availability of biofuels and investment preparedness of interested companies.' according to the country's national report on the implementation of the Biofuels Directive (Slovakia, 2004). The definitive national indicative targets for the period 2005-2010 will be defined in the National Programme, which is currently being elaborated.

### 9.3 Policy measures

Slovakia has indicated that it wants to follow a ‘step-by-step’ approach for the introduction of biofuels on the national transport fuel market. In this regard, the country especially stresses good management over fuel quality, taxes and state budget. Slovakia also emphasises the importance of building relations between companies in the entire biofuels production chain. Concrete policy measures are currently being developed.

Since Slovakia lacks bioethanol production capacity, it intends to start with blending 5% of biodiesel into diesel (B5) with reduced excise tax (‘red diesel’), which is used in agricultural and forestry production, in railway transport and in public transport. Rapeseed oil is the predominant feedstock for biodiesel production, but the use of recovered cooking oil has started as well. Higher concentrations may be used in captive fleets.

For this first phase of biofuels introduction to get started, the Act No 98/2004 on consumer tax from mineral oils would have to be revised first. According to the Law No 239/2001 of 22 May 2001 on taxes from mineral oils, fuels produced from renewable energy sources (bioethanol and biodiesel) are free of taxes. The law enables mixing of oil fuels with biofuels. However, mixed fuel is charged with taxes on the same extent as fuels from mineral oil what prohibits its sale.

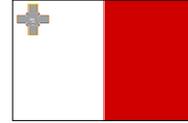
Currently, the following blends of regular fuels and biofuels are allowed on the Slovak market:

- diesel blended with 5 vol-% biodiesel
- biodiesel blended with 5 vol-% diesel
- petrol blended with 15 vol-% ETBE.

A financial support scheme, in addition to excise duty exemption for biofuels and biofuel blends, seems necessary for the Slovak biofuels market to develop. Although biodiesel is exempt from excise duty, its supply price remains uncompetitive. The policy measures to be developed should also include technical standards to guarantee the biofuels quality.

### 9.4 Conclusion

Slovakia has experience in producing and using biofuels and has biofuels production capacity available. However, it is clear that a financial support scheme is indispensable for maintaining and further developing biofuel production and use. Promotion of new investments in bioethanol/ETBE production and pilot programmes for production and application of biofuels could offer new perspectives for Slovakia, as well as intensive R&D in second generation biofuels since Slovakia has large potential in waste wood and agricultural residues. Slovakia intends to set up a national biofuels programme, but at this moment the concrete policy measures are still unclear.



## 10. Malta

Malta is an island state south of Sicily in the Mediterranean with a surface area of 316 square kilometres and 400.000 inhabitants. It has been independent since 1964 after 150 years of British rule and has joined the European Union in 2004. Its only energy sources are oil and oil products, which are imported by a state-owned company and amounted 34 PJ in 2001. A large amount of agricultural products is also imported. The consumption of transport fuels was 6 PJ in 2004.

### 10.1 Current and past activities

Edible Oil Ltd., a private company started trials to produce biodiesel from waste industrial (cooking) oil already in 1999. In 2003 their production of biodiesel was 30,000 litres, which is 0.02% of total transport fuels, and this was used in a demonstration project in vehicles of the Government's heavy plant. In 2004 400,000 litres of biodiesel were produced from waste oil, of which 180,000 litres were used for road transport, which amounts to 0.1% of total road transport fuels. The remainder was used for industrial purposes. According to Edible Oil Ltd. in 2005 they have produced and sold 1.4 million litres of biodiesel (ca. 0.8% of total transport fuels), used in the company's vehicles, government vehicles and sold at their single public pump.

Interest has been expressed by a number of other private enterprises in importing biofuel and setting up additional manufacturing facilities. However, Edible Oil Ltd.'s refining plant has already a capacity of 15,000 tonnes or 15 million litres. Estimates of collectable waste cooking oil are in the order of 3,000-7,000 tonnes per year, enough to produce biodiesel for 1.5-4% of total transport fuel use. In 2004 only 500 tonnes were collected and in 2005 approximately 1,000 tonnes. Collection has been somewhat difficult due to lack of local participation. Additionally, also some waste oil was imported.

### 10.2 Policy goals

Malta is a country with negligible potential in biofuels from agriculture, because of the limited freshwater resources (50% of potable water is supplied from desalination), high population density and poor soil fertility. On the other hand, Malta is totally dependent on imported fuel for all its energy needs. Therefore there is a strong motivator to find means to increase fuel diversity and to use renewable and indigenous energy sources. For alternative fuels, the use of LPG, LNG/CNG and electrical vehicles are considered, as well as biofuels. However, industrial and domestic waste is the only substantial source of biomass. In this respect, Government policy is as follows:

- To reduce the quantity of waste and to encourage higher levels of reuse.
- To increase recycling and composting.
- Further development of energy recovery technologies (anaerobic digestion).
- Safe disposal of residues that cannot be otherwise managed.

Material recovery and composting is given a higher ranking than energy recovery in this strategy. The strategy envisages composting of biodegradable waste with targets for reducing land filling as far as possible. As far as biomass from wastewater is concerned, investigations will be concentrating on electricity generation from biogas generated during the treatment process. With regard to these facts Malta states that biofuels can be produced and used more cost-effectively elsewhere (other than transport). However, there is potential for waste cooking oil to be collected and converted to biodiesel. For the end of 2005, the national indicative target for biofuels in road transport is 0.3%. No further outlook on the future use of biofuels is given yet.

### 10.3 Policy measures

With an act effective from the beginning of 2005 Malta has incorporated the Biofuel Directive into its national law. This act allows the use of biofuels and blends of biofuels and mineral fuels and requires the 'Malta Resources Authority' to monitor the effect of the use of biofuels in diesel blends above 5% by non-adapted vehicles. The act also requires the 'Malta Resources Authority' to report regularly on the progress of biofuel use in Malta and to give policy recommendations. Herein, they should consider the overall climate and environmental balance of the various types of biofuels (and other renewable fuels) and may give priority to the promotion of those fuels showing a very good cost-effective environmental balance while also taking into account competitiveness and security of supply and other national energy policy objectives. The regulation also imposes reporting duties on importers and producers as well as other obligations with regards to the sale and labelling of biofuels. Finally, the act has set a national indicative target for the end of 2005 of 0.3%.

During November 2004, the government announced that as from 2005, the biomass content (i.e. the percentage element) in biodiesel is exempted from the payment of excise duty. Also, an increasing number of government departments and agencies have started using biodiesel. Furthermore, policy measures and incentives have also been taken for electrical vehicles.

### 10.4 Conclusion

Malta has no possibilities for biomass production and its only biomass is industrial and domestic waste. However, the government has a priority list on how to deal as efficiently as possible with waste. As a result only waste cooking oil will be used for the production of biofuels. This has been started successfully in what seems a good cooperation between the government and a private company. The government has stimulated the production of biodiesel by using biodiesel in its vehicles.

The government has been very conservative in setting the target for 2005. The actual use of biofuels in 2005 was approximately three times as high as the 0.3% indicative target for 2005. Also, it seems that there is a potential for biodiesel from domestic waste cooking oil to contribute to 1.5-4.0% of total fuels for transport in Malta, which is more than the estimate from the 2004 EU Commission Staff Working Document. Herein it is estimated that Malta's potential of biofuels for road transport at 0.95 ktoe per year, which corresponds to 0.7% of the total transport fuel consumption. This figure, for which the exact sources are not known, had so far been taken as the maximum potential for biofuels in Malta.

Government policy on importing biofuels is unclear. It seems that the past and current promotion of biodiesel from domestic waste cooking oil is not so much driven by the desire for biofuels or the Biofuel Directive, but more by the perspective to make better use of domestic waste and reduce the pollution of waste water with waste cooking oil.

## 11. The Netherlands



The Netherlands is a small Western European country located near the North Sea with a total area (land and sea) of 41,500 km<sup>2</sup>. The country is densely populated and has ca. 16 million inhabitants. In the Dutch energy supply system, natural gas plays an important role, for the production of both electricity and heat. The Netherlands aims at achieving a renewables share in electricity production of 9% in 2010, according to the EU Renewable Electricity Directive. Currently, the share of renewables is 6.1%, of which two-third is contributed by bioenergy. For the total energy supply the share of bioenergy amounts to ca. 1.7%. At present, the main contribution comes from co-firing and waste incineration, and according to the 'Action Plan biomass' of the Dutch Ministry of Economic Affairs, these will remain the most important sources the next five years, supplemented by growing amounts of other sources, especially bio-based CHP plants.

### 11.1 Current and past activities

Within the context of reducing CO<sub>2</sub> emissions and increasing the use of renewable energy sources, the Dutch government acknowledged the importance of climate-neutral energy carriers - for transport but also for other sectors - by setting up the GAVE (gaseous and liquid climate-neutral energy carriers) programme in the late 1990s. This programme aims at accelerating the introduction of such energy carriers and was implemented by Novem (the Dutch Agency for Energy and the Environment) on behalf of three ministries, i.e. Spatial Planning, Housing and the Environment; Economic Affairs; and Transport, Public Works and Water Management. The first phase of the programme (1998-2000) aimed at exploring the perspectives for introducing new, clean, gaseous and liquid energy carriers on the Dutch market by means of demonstration projects, and if these possibilities existed, what would be the most attractive ones. The introduction of these energy carriers should contribute to achieving an accelerated trend breach in reducing CO<sub>2</sub> emissions and making the energy supply system more sustainable. The next phase of the programme (2001-2010) focuses on demonstrating production chains for the most promising options following these steps: establishing alliances between stakeholders, developing blue prints for the demonstration phase, realising demonstration projects, and finally, introducing production and use on the market. The activities of the programme, for both development projects and demonstration projects, received (partial) financial support. At present, the GAVE programme focuses at supporting the government and relevant market parties in their efforts within the framework of the EU Biofuel Directive.

The GAVE programme never really reached its original goal of supporting demonstration projects. The biofuel projects that came into the market were local initiatives resulting in the use of 4 million litres of biodiesel in 2003, mainly pure plant oil for road transport and biodiesel for recreation vessels. These are fiscally supported on a project basis. Several plans for large biodiesel plants were never realised, as financiers were unfamiliar with biofuels and there was no Dutch policy for biofuels.

With a general fiscal support for biofuels effective in 2006, two companies have started marketing biofuels: Argos Oil has started mixing in 5% of bioethanol in petrol and Shell markets petrol with ETBE. These biofuels are imported. Due to uncertainty about future biofuels policies, market parties have been hesitant to invest in new biofuel production installations for a long time. The recent increase in development of project plans has resulted in the establishment of two biodiesel plants so far.

## 11.2 Policy goals

The Dutch government decided to actively promote the use of biofuels, mainly with the aim of reducing transport-related CO<sub>2</sub> emissions and thus bringing the climate objectives closer to realisation. However, the Dutch government first issued several studies in order to find out which biofuel production chains were the best ones and should be promoted. After many years of studies, it was concluded that the current biofuels, pure plant oil, biodiesel and bioethanol, were not cost-effective in reducing greenhouse gas emissions. Only the so-called second-generation biofuels, such as Fischer-Tropsch diesel from biomass and bioethanol from lignocellulosic waste or crops, were identified as a promising option for biofuels. However, the production processes for these biofuels are still being developed and the Dutch government stimulates these developments, although not to such extent as e.g. in Germany.

Thus, for some time, the Dutch government did not intend to promote the current biofuels, pure plant oil, biodiesel and bioethanol. However, under pressure of rapeseed oil producers, local governments and especially the EU Directive, the Dutch government has decided to make a start with a market biofuels and set a target for 2% of biofuels in 2006, to be realised by mixing in bioethanol (or ETBE) into petrol and biodiesel into diesel. Pure plant oil is still only stimulated on a project basis, as this is not regarded as an important biofuel for large-scale use.

In March 2006, the government policy for 2007 and onwards was announced. In 2007 fuel suppliers will be obliged to ensure that at least 2% (energy basis) of their annual fuel sales consist of biofuels. In the coming years, the obligatory target will gradually be increased towards a minimum target of 5.75% in 2010.

## 11.3 Policy measures

Prior to 2006 biofuels were only fiscally supported on a project basis and the budget for this support was relatively small, at least not high enough to have a significant market penetration of biofuels. In September 2005, the Dutch government announced its biofuels policy for the coming years aiming at the 2% biofuels share in total transport fuel sales. Although initially imposing a mandatory biofuels target to the market was not considered a realistic possibility for the short term, the government nevertheless decided to oblige fuel suppliers to blend 2% biofuels in their total fuel sales, as of 2007.

In 2006, which is considered a transitional year, there will be fiscal support for biofuel blends in order to compensate for the financial gap with regular petrol and diesel. The tax exemption is granted for a maximum biofuels volume incorporated in a blend of 2%. If the biofuels proportion is below 2%, the level of tax exemption will be adjusted accordingly. Biodiesel and bioethanol will be eligible for this tax exemption, but pure vegetable will be excluded since it cannot be blended with regular diesel and must be used in adapted vehicles. Instead, pure vegetable projects may apply individually for a tax exemption within the context of innovation programmes. This decision resulted in protests from small (potential) pure vegetable oil producers.

The biofuels obligation in place as of 2007 applies to both petrol and diesel to guarantee that the development of biofuels will be initiated in both markets. To increase flexibility in complying with the targets, fuel suppliers are allowed to trade their surpluses or shortages, based on a mutual statement. Fuel suppliers that do not comply with the obligation will get a financial penalty. Although first generation biofuels will be needed to comply with short-term biofuels targets, the government actively aims at promoting second-generation biofuels. Within the obligation system, this can be done by awarding more credits to biofuels according to their CO<sub>2</sub> reduction performance, or by setting a required share in the biofuels mix for second-generation biofuels. In addition, the government is considering the possibility of imposing minimum sustainability requirements and of setting up an international certification system for biofuels. Furthermore, the Dutch government has allocated a budget of € 60 million for the period 2006-2010. This support

aims mainly on the development of advanced biofuel production technologies. Projects applying for a subsidy should meet the following criteria:

- Achieve an improved greenhouse gas balance and lower land-use.
- Market potential and chance of success, taking into account cost reductions as a result of technological learning ('learning curve').
- Subsidy-effectiveness.
- Other environmental benefits.

## 11.4 Conclusion

The Netherlands did not have a tradition in producing or using biofuels, but has long had intentions to promote them within the context of the Kyoto protocol and the EU Biofuels Directive. It considers biofuels to be a component of a long-term transition towards a more sustainable transport sector and energy supply system. After many years of advisory studies, the intention was not to support the production of the current available biofuels, but to stimulate only the more cost-effective second-generation biofuels, which, however, were not on the market yet. Research for second-generation biofuels has been stimulated, but not with the same persistence as e.g. in Germany. In the mean time, private initiatives for pure plant oil and biodiesel received only support on a small scale. Repetitive requests for more stimulation of biofuels were not acknowledged, frustrating enthusiastic entrepreneurs.

Now that the Dutch government has decided to give fiscal support for biofuels for 2006, two companies have started marketing biofuels. There is yet no large-scale production of biofuels in the Netherlands. This slow start is due to the fact that the government was unsuccessful in providing the long-term guarantees to market parties that are necessary to develop a stable domestic biofuels market. Frequent changes in government support in another sector, renewable electricity, have neither done any good to investors' confidence in the government policies. Recently the government policy for 2007 and onwards has finally been announced, creating a longer-term framework for support for biofuels. The design of the second phase aiming at the introduction of second-generation biofuels is, however, still under consideration.



## 12. United Kingdom

The United Kingdom is situated in North Western Europe and has a surface area of 242,534 square kilometres and has 59.3 million inhabitants. It consists of England, Wales, Scotland and Northern Ireland. It is a member of the European Union since 1973. The UK's main energy sources are natural gas and oil and to a lesser extent coal and nuclear. The UK is currently shifting from being a net energy exporter to becoming a net energy importer. The consumption of petrol and diesel for transport was 1551 PJ in 2001.

### 12.1 Current and past activities

Biofuel use in the UK started directly after the government gave partial duty exemptions for biofuels. In July 2002 a duty exemption of 20 pence per litre (ca. 0.30 €/l) was granted for biodiesel. This is a fairly low tax exemption and, therefore, only the cheapest biodiesel can be brought into the market. This is mainly biodiesel from waste vegetable oils, which is produced in small plants. Also, some soy and palm oil is imported, as well as some rapeseed methyl ester (RME). In the remainder of 2002, 2.7 million litres of biodiesel were sold. In the next year, 19.5 million litres of biodiesel were sold, which was approximately 0.04% of total road transport fuels. In 2004, 21 million litres and from January to May 2005 approximately 10 million litres biodiesel were sold. The biodiesel is used in blends at or below 5% and these are currently available at over 100 filling stations in the UK, including a number of major supermarket sites.

Although the production and sales of biodiesel have not increased much from 2003 to the first half of 2005, this is about to change, because of new production capacity coming on line. In Scotland, Argent Energy's plant with a capacity of 50 million litres of biodiesel from waste vegetable oils and tallow has started production in March 2005. Biofuels Corporation's biodiesel plant, also from waste oils, with a capacity of 250,000 tonnes (ca. 284 million litres) in Seal Sands, Middlesbrough, is in its final stages of commissioning. Greenergy's plant with a capacity of 100,000 tonnes biodiesel per year from waste oils and rapeseed oil at Immingham at the east coast is currently being built. All three plants are built by foreign manufacturers.

A duty tax exemption for bioethanol came in force in January 2005. Before that bioethanol sales were negligible, but from January to May 2005 already 28.7 million litres bioethanol were sold (ca. 0.04% of total yearly transport fuels). These are exclusively imports and mainly from Brazil. Greenergy oil company is the main importer and the bioethanol is blended into petrol up to 5% and marketed via supermarket filling stations. There are plans for domestic bioethanol plants, but these depend on more assurances from the government in supporting domestic bioethanol production.

### 12.2 Policy goals

UK policy on biofuels started late compared to many other countries in Europe. In its White Paper 'Our energy future' from 2003, the UK government includes biofuels as one of the means to achieve its environmental, security of supply, competitiveness and social goals for a long-term energy strategy. Besides biofuels, also increased car efficiencies, hybrid vehicles and alternative fuels natural gas, LPG and hydrogen should contribute to clean low carbon transport. As for biofuels, the UK is particularly interested in supporting the development of bioethanol and biodiesel production from biomass such as farm wastes, forestry residues, coppice crops and domestic waste, because these can potentially deliver bigger carbon savings and wider environmental, farming and rural employment benefits than biofuels made from food crops.

The UK Government's approach to the promotion of biofuels is aimed at the long-term. Therefore, it wants to consider carefully the most appropriate mechanisms to ensure the greatest carbon savings possible from biofuels at the lowest cost. These include considerations on enabling the direct processing of biofuels into the oil refineries and some form of renewable fuel obligation. This takes time to develop and implement, but the UK regards this as time well spent and allowing greater benefits over the long term. However, the UK recognises that the industry must start somewhere while the government deliberates future measures and, therefore, the current partial duty exemptions for biodiesel and bioethanol have been put in place. These are fairly low compared to other countries and the British industry has called for a higher level of incentive.

However, according to the UK government, the cost of the current incentive already outweighs the benefit and biofuels are currently an expensive method of carbon abatement. Also, according to the UK's economic analysis, higher incentive levels would currently largely result in imports, including from outside the EU. This would limit the potential benefits to the UK and broader EU agricultural and rural sectors. In addition, there is strong concern that this could lead to further deforestation in South East Asia and South America.

With the low duty rates being introduced, the UK government estimates that biodiesel and bioethanol could account for up to 5% of total fuel use by 2020. For 2005, it has set a target of 0.3%, because of the low starting point of biofuel use compared to other countries.

### 12.3 Policy measures

The Hydrocarbon Oil Duties Act from 1979 originally did only tax mineral fuels and not biofuels. Although biofuels were not used in the UK at that time, the act was changed to include mineral fuel substitutes, such as biofuels, in 1995 in order to prevent tax losses to the state and in order to comply with 1992 regulations from the EEC. However, subsequent EEC regulations did allow exemption of the fuel tax for biofuels. From July 2002 the excise duty on biodiesel was lowered by 20 pence per litre (ca. 0.30 €/l), compared to fossil diesel. When taking into account also the reduction of the amount of Value Added Tax (VAT), the reduction is almost 0.35 €/l. Effective from January 2005 an identical duty relief (but compared to petrol) was introduced for bioethanol. Both duty relieves are guaranteed for three years rolling, which means that they are currently valid until the end of 2008.

The duty relief for bioethanol does not apply to ETBE. The government is still assessing the environmental, health and safety implications of the use of ETBE. There will be no tax exemption for pure plant oil in the UK. There was some confusion about this issue because so far it seemed that also pure plant oil was exempted from tax. This has now been cleared and producers have to pay the usual taxes, even with retroactive effect. This is a drastic measure, but the pure plant oil production was very small.

Capital grants for the investment in commercial plants can be given under the 'regional selective assistance'. The EU allows this only for certain regions, because otherwise it is regarded as market distortion. The Argent Energy's plant received from the Scottish Executive £1.2 million (ca. € 1.8 million) on a total investment of £15 million. For Biofuels Corporation's plant in Seal Sands an equal amount has been granted by the UK North East Regional Development Agency. The government is considering 'enhanced capital allowances' for biofuel plants, which allows profitable write-offs. Also this measure would be subject to the EU approval.

The UK Government has also been leading by example in promoting and using biofuels. The Government Car and Despatch Agency (GCDA) uses a 5% biodiesel blend in its London-based delivery vehicles and many local authorities and police authorities are using biodiesel in their fleets. The government also supports R&D projects on the development of advanced production methods for biofuels.

The 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. This would place a legal obligation on transport fuel suppliers to supply a specified biofuels proportion of their road fuels to their customers. The study is due to conclude shortly.

The UK is also exploring the possibilities for the use of biomaterials (e.g. rapeseed oil) in conventional oil refineries. The product of this process would be conventional diesel or petrol and the only difference would be that the inputs to the process would be a mixture of mineral and biomaterials. This could give a lot of the benefits of conventionally processed biofuels without the cost and complication of separate fuel blending and distribution arrangements. It would also allow considerable economies of scale. However, apart from the technical issues to be addressed, also the taxation policy should be changed, because currently the fiscal regime focuses on the output of the refineries and not on the input.

## 12.4 Conclusion

Only around 2000 the UK started its promotion on biofuels. Before then there was no specific policy on biofuels. As they were not regarded as a cost-effective means to reduce greenhouse gas emissions and security of energy supply was not much of an issue, because of the UK's oil and gas reserves. Also, it was expected that promotion of biofuels would result mainly in imports and would not contribute to rural development in the UK. Under pressure of small entrepreneurs and the EU Biofuel Directive, partial tax exemptions were given first for biodiesel and later for bioethanol. These exemptions are lower than in most other European countries and as a consequence only the cheapest biodiesel and bioethanol is introduced into the market. In the case of biodiesel the feedstock is mainly domestic waste vegetable oil. In the case of bioethanol this is mainly import from Brazil.

The policy for biodiesel seemed to have its intended effect: domestic biodiesel production flourished with the least amount of support and at the same time effective use of a waste stream. However, without extra support, the industry expects that biodiesel sales will stabilise at around 250,000 to 300,000 tonnes annually, which is less than 1% of UK road fuel use. The partial duty exemption for bioethanol has resulted exactly in what the government feared: large imports from Brazil. Apparently, the Brazilian bioethanol can be delivered at a price where it is profitable, even with the existing import duty (0.192 €/l for undenatured alcohol and 0.102 €/l for denatured alcohol). For domestic bioethanol production the current measures seem to be not enough. Based on current sales of biofuels in the UK, it seems that the UK will reach its aimed target of 0.3% of biofuels.

The UK is still hesitant about its approach to biofuels. The UK is considering its long-term strategy on biofuels and is has executed a public consultation, called 'Towards a UK strategy for biofuels'. It seems already that the UK does not want to given higher tax exemptions for biofuels, because of the costs involved, but also because this would create overcompensation for biofuels from cheap feedstocks, such as waste vegetable oil. The government is looking for other potentially cheap methods such as a biofuel obligation or direct blending of biomass streams at the oil refineries. Furthermore, its view on biofuel import is still unclear. It seems that sustainability requirements for imports are a serious option. Effectively, the UK is delaying its important choices, possibly awaiting actions from the European Commission. However, it has made a start using biofuels and is, thus, ready to pick up the pace if and when the political decision to spend more money on biofuels is made.

## 13. Conclusions and recommendations on European biofuel policies

In the preceding chapters, the history of biofuel policy and recent developments in the frame of the EU Biofuels Directive have been described in detail for ten EU Member States that have achieved different degrees of success of biofuels market penetration. In this chapter, main conclusions for each Member State will be presented, as well as for each group of countries:

1. Successful market introduction: France, Germany, Spain, and Sweden.
2. Developing a stable market: Czech Republic, Poland, Slovakia.
3. Starting with introduction of biofuels: Malta, the Netherlands, United Kingdom.

Based on the conclusions presented here, policy recommendations will be given for Indian and South East Asian policy makers and other biofuels stakeholders.

### 13.1 Successful market introduction: France, Germany, Spain, Sweden

The experience in *France* clearly shows the effectiveness of high levels of tax exemption and strong partnerships between parties involved in all segments of the biofuel production chain, especially farmers and oil companies. However, it also became clear that without any limitation on the biofuel volumes eligible for tax exemption, state expenses for the promotion of biofuels could not be controlled. This was the reason for the introduction of a maximum volume of biofuels that could make use of the excise duty exemption. This volume, as well as the level of tax exemption, is adjusted every year to avoid overcompensation.

In *Germany*, the agricultural sector played an important role in the development of the biodiesel sector. In contrast to the French situation the large oil companies were not involved. The role of the car manufacturers, who started adapting their cars for the use of pure biodiesel, was crucial. Furthermore, fuel pumps suddenly became available as leaded petrol was prohibited. The fact that pure biofuels, being non-mineral oil based fuels, enjoyed full tax exemption from the very beginning was important for the growth of the biodiesel sector. Biofuel blends only entered the market after the introduction of proportional tax exemption applicable for blends of biofuels and mineral oils in January 2004. This also resulted in the involvement of the oil industry. However, also the German government monitors the impacts of this excise duty relief and will adjust it in the case of overcompensation. Germany is considering the implementation of obligatory targets for blending biofuels to replace the current system of tax relief.

In *Spain* the start-up of its bioethanol sector was initiated by the co-operation between Abengoa and two oil companies, whose influence led to a logical choice for producing ETBE. Full tax exemption combined with the importance of the agriculture in regional development policies created favourable conditions for bioethanol/ETBE in Spain. In comparison with bioethanol, biodiesel production started to develop much later, since there was no influencing actor taking the initiative and full tax exemption was not sufficient for biodiesel to make it financially attractive in comparison with mineral diesel. Finally, the quality standard for biodiesel is not suitable for the Spanish situation, since it is based on rapeseed feedstock, which cannot be grown in Spain. For other feedstocks, such as sunflower, which can be grown in Spain, it is more difficult to meet the biodiesel quality standard.

The experience of *Sweden* shows that it is also possible to successfully apply low-volume bioethanol blends, without converting bioethanol into ETBE first, which is done in France and Spain. In contrast to most countries where biofuels play a relatively important role, the development of the biofuels sector in Sweden is mainly driven by environmental considerations, and

it is combined with promotion of the use of cleaner technologies in transport such as environmentally friendly cars. Sweden is the only country that is importing biofuels on a large scale, and these imports largely explain the strong growth of biofuel use, especially bioethanol, in the past years. However, there is a risk of increasing biofuel prices, if other countries are to cover their increasing biofuel demand (partly) by imports as well.

These success stories have several common factors:

- longer-term fiscal support,
- initiating organisations,
- political willingness.

The most important is fiscal support for biofuels guaranteed for a longer term. The way these countries have given the fiscal support is different, as well as the amount given. France allows the tax exemption for a limited volume of biofuels and carefully calculates the amount of tax exemption to be given, whereas Germany on the other end gives a full tax exemption for unlimited volumes of biofuels. The second factor in common is that they all in a way had an organisation firmly lobbying for the introduction of biofuels. In France and Germany this was the agricultural sector, in Spain the multinational Abengoa. Also, in all countries at least the car manufacturers or the oil companies participated, making the distribution of the biofuel possible, either as pure biofuel or a blend. In Germany, where the oil companies initially did not participate, the car manufacturers provided cars suitable for biodiesel and many independent filling stations marketed the fuel, as they had a pump available when leaded petrol became prohibited. Equally important was the political willingness to support biofuels. In Sweden and Germany left-wing/green parties' environmental motivations were important for the political support for biofuels, whereas in France and Spain support of the agricultural sector was considered important by the politicians.

### 13.2 Developing a stable market: Czech Republic, Poland, Slovakia

As a result of government support, the *Czech Republic* has been very successful in stimulating biodiesel production and use. However the current financial support system is gradually being changed after EU accession, which creates less favourable economic conditions for biofuels. Currently, there is a trend towards exporting biofuels as domestic legislation (i.e. the system for refund of excise duty) is too complicated and bureaucratic.

In *Poland* the surplus of agricultural production and the strong agriculture and agro-industry lobby were the driving forces for the development of the bioethanol/ETBE sector. Although the government considers an appropriate level of excise duty exemption a key measure for promoting the use of biofuels, limited availability of financial government resources forms a barrier. In addition, if there is a lack of necessary laws on quality requirements and analysis and control methods, tax exemption only will not be sufficient to bring (more) biofuels to the market. Furthermore, Poland is an example of how an unstable legal framework and taxation, and time-consuming processes to change this as a result of political discussion and bureaucracy, lead to instability, or even a decline, in the biofuels market.

The situation in *Slovakia* also shows the clear impact of changes in the financial support system, in this case abolition of state subsidies, which caused many industrial parties to restrain or even stop their business activities in the field of biofuels.

The Czech Republic, Poland and Slovakia all started with the introduction of biofuels as a measure to support the agricultural sector. They have used fiscal support, but have either changed or abolished it one or several times, which is detrimental for the biofuel industry. In addition to this uncertainty of policy, much of the announced legislation has been delayed and the production and use of biofuels has also been accompanied with a lot of bureaucracy. Espe-

cially in Poland, clear quality standards and quality control measures have been lacking. This led to a bad image for biofuels as consumers did not have confidence in fuel quality.

### 13.3 Starting with introduction of biofuels: Malta, the Netherlands, UK

Being a small island state totally dependent on imported fuel for all its energy needs, the approach of *Malta* differs from other EU countries, since for Malta increasing fuel diversity and to use renewable and indigenous energy sources is the main driving force for developing biofuels. Since the country has negligible potential for producing biofuels from agricultural crops, industrial and domestic waste is the only substantial source of biomass available. The government has a priority list of how to deal as effectively as possible with the waste. As a result waste cooking oils are collected and utilised for the production of biodiesel, which is stimulated by the government by using it in its vehicles.

The government of *the Netherlands* considers the use of climate-neutral energy carriers, such as biofuels, as an integral component of a long-term strategy towards a more sustainable transport sector and energy supply system. Although the country has no tradition in producing and using biofuels so far, it aims at strong promotion of biofuels the coming years, within the context of the Kyoto protocol and the EU Biofuels Directive. However, the government had not provided longer-term guarantees to market parties regarding future developments in the legislative framework for a long time. Recently, the biofuels policy for 2007 and onwards was announced including mandatory targets for the period 2007-2010 and active support of second-generation biofuels.

The *United Kingdom* also includes biofuels as one of the means to achieve its environmental, security of supply, competitiveness and social goals for a long-term energy strategy. However, the UK is still hesitant in its approach to biofuels. It does not want to give higher tax exemptions to biofuels because of the higher costs and the risk of overcompensation. In addition, the partial duty exemption in place has already resulted in undesirable imports of cheap bioethanol. The government is currently exploring other ways for the longer term to promote the use of biofuels, such as a Renewable Transport Fuels Obligation (RFTO), which would place a legal obligation on fuel suppliers to sell a specified biofuels proportion. Just like in the Netherlands, political decisions will have to be made before the domestic biofuels market can really develop.

Malta, the UK and the Netherlands have had a different approach to the use of biofuels than countries like France and Germany. Their view was that the extra costs for biofuels did not outweigh the benefits, keeping this option open for the long term. Still, these three countries have been actively developing their policy for biofuels with a view to the future and also under pressure of the EU Directive. Malta and the UK have chosen to make a start with a relatively small amount of biofuels, by giving only a modest tax exemption for biofuels. This is not only an effective way to make use of waste oils, but also effective in starting a biofuel market at minimal costs. The Netherlands and the UK have been actively pursuing and developing policy instruments to encourage the introduction of more cost-effective biofuels. The UK will probably not face many problems when these policies are implemented, because it already has a market for biofuels and guarantees three years of continuation of current fiscal support. In the Netherlands, uncertainty regarding future biofuel policies resulted in a poor investment climate for biofuels and fairly low confidence of market parties.

### 13.4 Policy recommendations

The history of biofuels policies in European countries shows that the following factors have been crucial for the introduction of biofuels in these countries:

1. Political commitment to biofuels.
2. Active market actors and/or lobbying groups initiating biofuels activities.

3. Financial compensation for the financial gap between biofuels and fossil fuels.
4. End-user market for pure or blended use of biofuels.

#### *Political commitment to biofuels*

Political commitment to biofuels for a longer period of time is crucial for creating a favourable investment climate and market conditions. This political willingness should be translated into effective biofuels promoting policies that are:

- clear,
- non-bureaucratic,
- consistent for a longer period of time,
- specific for the national context to optimally utilise the country's assets.

#### *Active market actors and/or lobbying groups initiating biofuels activities*

Market parties taking the lead and willing to invest are very important for developing a biofuels market. Which parties may be the initiators and what partnerships they could involve strongly depends on the local context. The establishment of consortia between fuel suppliers, biofuel producers, farmers, industrial companies, oil companies, car manufacturers, research institutes, consumer associations etc. also largely determines what biofuels will develop and to what extent.

#### *Financial compensation to bridge the financial gap between biofuels and fossil fuels*

A longer-term fiscal support system, bridging the financial gap with fossil fuels, is a very effective means for creating favourable market conditions. The exact design of the fiscal support system (types of biofuels, pure biofuels and/or biofuel blends, differentiated levels of tax exemption, etc) has also clear consequences for the development of different biofuels and the resulting biofuel mix on a national market (e.g. Germany). However, possible risks of such a system are overcompensation and state budget implications, especially if there is no limit on the biofuels volume eligible for the tax exemption. This can be prevented through monitoring and introducing a maximum level of tax exemption and/or a maximum to the biofuels volumes that can make use of the exemption (e.g. Germany, France). Moreover, a fiscal support system cannot guarantee in advance that the targets for market penetration of biofuels will be achieved. Being aware of these drawbacks of fiscal support system, some EU Member States are considering or introducing mandatory biofuels targets to fuel suppliers (e.g. Germany, the Netherlands, United Kingdom). Certification of biofuels and setting sustainability requirements is currently subject of discussion as well in various European countries.

#### *End-user market for pure or blended use of biofuels*

Another important prerequisite for successful introduction of biofuels is the presence or creation of an end-user market for biofuels. This may be a large market able to use biofuel blends, such as all passenger cars running on petrol or diesel. Another possibility is to use vehicle fleets that are equipped with adapted engines for the use of (almost) pure biofuels, for example captive governmental fleets ('leading by example'). In any case, end-users of biofuels need the guarantee that biofuels or blends with biofuels can be used in their cars without damage. Therefore, generally the involvement of either the car industry (use of pure biofuels) or the oil industry (use of biofuel blends) or both is necessary for reliable and effective biofuel distribution and use. Also, it requires quality standards for biofuels and biofuel blends, since their absence (e.g. Poland) or their inapplicability (e.g. Spain) is an enormous barrier to market introduction. Furthermore, such standards facilitate European biofuels trade.

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