A spring-board for your exports

EU Handbook
Biofuel Markets

Prepared by the CrossBorder Bioenergy Working Group

Cross Border Bioenergy supports the bioenergy industry in going international to diversity its sales markets
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This project is designed to help SMEs to evaluate markets in Europe and support their decision-making process to invest in them. Join the Cross Border Bioenergy network and benefit from exclusive information on European markets. There are absolutely no cost associated with the use of the network.

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Prepared by the Cross Border Bioenergy Working Group
on Biofuel technologies
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**Glossary**

**BBE** - German Bioenergy Association  
**CAP** – Common Agricultural Policy  
**C.A.R.M.E.N. e.V.** - Centrales Agrar- Rohstoff Marketing- und Energie-Netzwerk e.V.  
**CDM** – Clean Development Mechanism  
**CHP** - Combined Heat and Power  
**DEA** - Danish Energy Agency  
**DERA** - Danish Energy Regulatory Authority  
**DH** - District Heating  
**EAFRD** - European Agricultural Fund for Rural Development  
**EBB** – European Biodiesel Board  
**EIB** – European Investment Bank  
**EMS** - European Monetary System  
**EMU** - Economic Monetary Union  
**EOF** - Danish Oil Industry Association  
**ePure** – European renewable ethanol association  
**ERM** - Exchange Rate Mechanism  
**ETBE** - Ethyl Tert-Butyl Ether  
**ETDDP** - Energy Technology Development and Demonstration Programme  
**FAME** - Fatty Acid Methyl Ester  
**FNR** - Fachagentur Nachwachsende Rohstoffe e.V.  
**FQD** - Fuel Quality Directive  
**GHG** - Greenhouse Gas  
**HVO** - Hydrogenated Vegetable Oil  
**IFC** - International Finance Corporation  
**ILUC** – Indirect Land Use Change  
**KEOP** - Environment and Energy Operative Programme  
**LIAA** - Investment and Development Agency of Latvia  
**LS** – Latvian currency: Lats  
**nREAP** - National Renewable Energy Action Plan  
**ÖNACE** - Austrian classification of economic activities of companies  
**PPO** - Pure Plant Oil  
**RED** - Renewable Energy Directive  
**RENERGIE** - Raiffeisen Managementgesellschaft für Erneuerbare Energie GmbH  
**RES** - Renewable Energy Sources  
**RME** - Rape Methyl Ester  
**RS** - Renewable Sources  
**SCH** - Small Scale Heating  
**TPES** - Total Primary Energy Supply
1. Introduction to the Market

1.1. Aim and Methodology of the Cross Border Market Handbook

The general objective of the Crossborder Bioenergy project is to help SMEs to evaluate bioenergy markets in Europe in view of cross-border investments, thereby making SMEs less dependent on fluctuating domestic market conditions and strengthening the whole bioenergy industry. Five different bioenergy market sectors are considered: biogas, small scale heating, district heating, CHP and biofuels for transportation. The project will contribute to member states’ efforts to reach their targets set in the RES directive, to benchmark national RES action plans, and possibly to implement flexibility projects as mentioned in the RES directive.

With this project bioenergy companies will get a ‘navigator’ on potential markets in Europe, and get necessary tools to develop a market entry strategy. The GIS-Tool helps bioenergy companies in comparing European markets and, based on this comparison, in defining possible target markets. Following this first step the market handbooks offer more detailed information about single countries and regions in Europe and furthermore, describe and explain the situation in the different bioenergy markets in Europe. The B2B-plattform can support direct action by facilitating contact and networking between bioenergy stakeholders and companies. In this section of the website, furthermore concrete offers and inquiries can be posted and a calendar informs about interesting upcoming events.

To achieve these goals the consortium of the Cross Border Bioenergy project undertook a detailed study of the five different bioenergy markets in Europe. Under participation and contribution of many international bioenergy companies and stakeholders, the consortium identified about 50 relevant criteria and summarized them in 8 main categories. The 8 categories cover the important factors influencing the bioenergy sectors, namely:

- Basic Country Data
- Energy Policy
- Feedstocks
- Business Case
- Market Environment
- Regulation
- Project Financing
- Readiness for Uptake

The identified criteria are concretized by more than 300 indicators, which are weighted according to their respective importance. By doing so, scores for each indicator, criterion and category as well as an overall sector score were generated. To ensure scientific reliability the Imperial College London was obliged with working out a sound methodology defining the scoring and weighting mechanisms. A method was worked out to process these criteria and find appropriate indicators, and a comprehensive template was produced.

The results that are presented in this
handbook and on the website are based on official statistics, national action plans, support schemes and furthermore on direct information gathered from bioenergy experts from the single countries in interviews and enquiries undertaken especially for this project. As many different reliable sources have been included in the research process, the results offer a comprehensive picture of the bioenergy markets in Europe.

The full list of categories, criteria and indicators chosen for the biofuels sector is available in the biogas sector handbook, provided for download at www.crossborderbioenergy.eu under the rubric ‘publications’. The annex furthermore provides a table containing the leading questions on the basis of which the market handbook was built up on.

1.2. INTRODUCTION TO BIOFUELS

Biofuels are a key factor with regards to achieving the EU-wide 2020 target of a 10% share of renewable energy in the transport sector. This target is viewed by many as one of the most difficult to reach, as the biofuel usage today is small in most EU-27 countries. The sector will therefore have to grow rapidly within the coming years in order to achieve the 2020 target. New feedstock and production methods, so called ‘second generation’ biofuels, which are based on more cellulosic biomass, are on the verge of commercialization. However, today’s market and the market of a foreseeable future will be mostly based on first-generation sugar, oil, and feedstock rich in starch.

All biofuels for transport sold within the EU-27 region must follow the sustainability regulatory framework set by the renewable energy directive1 in order to be eligible to be included in the target set by the EU. Biofuel produced from residues, waste or cellulosic material can be double counted in the EU 2020 target.

The growth pattern of the market sector will mainly depend on four factors: fluctuations in the fossil crude oil price; the development of domestic biofuel production; changes in global biofuel trade patterns that affect imports, as well as the commercialization phase of newly developed biofuels and their production methods. Furthermore, the development rate will first and foremost be affected by political decisions-making, which makes the market unsecure and difficult to predict. Even right now the regulatory framework is being discussed and market incentives are being renegotiated within the EU-27 creating a rapidly

changing market. Moreover, biofuel policies and incentives are more and more likely to be subject of change on national levels, making market specific knowledge invaluable.

The market handbook focuses on available and commercially viable biofuel technologies on the European market: bioethanol and biodiesel. However, it also provides information for stakeholders interested in the establishment of new techniques. Both bioethanol and biodiesel fuels can be used as low-blends in gasoline or diesel, as high blends (E85; ED95), or as pure fuels (B100). For the latter two options, special engines have been designed. Due to their versatility, the market potential of these fuels is not as limited as that of other biofuels making them very attractive. Both, bioethanol and biodiesel, furthermore hold the advantage that they can be produced by a range of production methods based on various feedstock. The production plants can be both large-scale and small-scale. Due to the versatile nature of the fuels, they are very attractive for the export market as production can adjust to regional conditions and market structures.
2. COMPARISON OF EUROPEAN COUNTRIES

2.1. CROSS BORDER SCORES OF EU COUNTRIES

The Top Ten Country Score gives an overview of the ten most attractive countries in the biodiesel sector. All indicators are included in this overall score, which can be a first indicator of attractiveness.

Source: all tables and figures that are not cited otherwise are based on data from the CBB project: http://www.crossborderbioenergy.eu (November 2011)

The Top Ten Country Score gives an overview of the ten most attractive countries in the bioethanol sector. All indicators are included in this overall score, which can be a first indicator of attractiveness.
2.2. Basic Country Data

The analysis of the countries' basic data is based on the analysis of the geographical and climatic conditions, demography and logistical infrastructure. The figure below shows the CBB basic data score for all European Countries.

The EU-27 member states show a large variation regarding their socio economic status, industrial development, size of the agricultural sector and feed-stock availability. These are all factors that significantly influence the biofuel market's readiness and the measures taken to reach the EU wide target, achieving 10% renewable energy in the energy sector by the year 2020.

As the eastern region of Europe receives the largest structural funds for infrastructure and energy upgrades in combination with their large feedstock availability it makes them interesting regions for production investment. At the same time this region is also the farthest from reaching the 2020 targets for the transport sector, and therefore needs to further strengthen its market potential.

The market potential for advanced biofuels and biofuels designed for low blend and drop in fuels is huge in Europe as only one country, Sweden, has reported that they will reach the 2020 target for the transport sector already in 2012. The use of biofuels in the transport sector in 2009 is shown in Table 'Final Energy Consumption'.

In all countries the increase in the low blend market is expected to be large as E10 (10 % bioethanol and 90% fossil gasoline) currently is only marketed in four countries: France and recently Finland,
Spain and Germany. A similar pattern is seen for B7.

When it comes to high blends and pure biofuels, the situation is bleaker. Historically, there has been a strong B100 market in many parts of Europe, especially in Germany. However, due to changes in the incentive structure this market has decreased significantly leaving a large overcapacity for biodiesel production in Europe. The only country that has well developed fuelling logistics for E85 is Sweden. Finland, France and a few more countries have implemented E85 on a trial basis but it is still not a fuel that is readily available nationwide. All countries report on incentive structures for low blend fuels but there seems to be a low interest amongst policy makers to promote high blend or pure biofuels across Europe, making this a much more uncertain market.

In almost all European countries the transport sectors energy use is increasing and the diesel market share is increasing in all regions, both within light and heavy traffic. Therefore, increased attention to this sector is needed to reach the EU’s GHG reduction targets. Biodiesel is the main biofuel in Europe as can be seen in Table ‘Consumption Biofuels’, showing the amount of different biofuels consumed in the EU-27 in 2009.
Table ‘Final Energy Consumption’: Final energy consumption in the transport sector in 2009, by fuel (ktoe)

<table>
<thead>
<tr>
<th></th>
<th>All products (ktoe)</th>
<th>Share of biofuels in total final energy consumption in transport (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU-27</td>
<td>367.636</td>
<td>3.92%</td>
</tr>
<tr>
<td>Austria</td>
<td>8.628</td>
<td>6.93%</td>
</tr>
<tr>
<td>Belgium</td>
<td>11.131</td>
<td>3.02%</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>2.927</td>
<td>0.20%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>6.615</td>
<td>3.70%</td>
</tr>
<tr>
<td>Denmark</td>
<td>5.194</td>
<td>0.23%</td>
</tr>
<tr>
<td>Germany</td>
<td>61.736</td>
<td>5.70%</td>
</tr>
<tr>
<td>Estonia</td>
<td>744</td>
<td>0.00%</td>
</tr>
<tr>
<td>Ireland</td>
<td>4.693</td>
<td>2.07%</td>
</tr>
<tr>
<td>Greece</td>
<td>9.218</td>
<td>0.93%</td>
</tr>
<tr>
<td>Spain</td>
<td>37.837</td>
<td>3.34%</td>
</tr>
<tr>
<td>France</td>
<td>50.400</td>
<td>5.79%</td>
</tr>
<tr>
<td>Italy</td>
<td>42.289</td>
<td>3.25%</td>
</tr>
<tr>
<td>Cyprus</td>
<td>1.019</td>
<td>1.67%</td>
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<tr>
<td>Latvia</td>
<td>1.027</td>
<td>0.58%</td>
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<td>Lithuania</td>
<td>1.501</td>
<td>4.33%</td>
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<tr>
<td>Luxembourg</td>
<td>2.488</td>
<td>1.89%</td>
</tr>
<tr>
<td>Hungary</td>
<td>4.785</td>
<td>2.86%</td>
</tr>
<tr>
<td>Malta</td>
<td>245</td>
<td>0.00%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>15.104</td>
<td>3.17%</td>
</tr>
<tr>
<td>Poland</td>
<td>16.569</td>
<td>4.68%</td>
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<tr>
<td>Portugal</td>
<td>7.340</td>
<td>3.11%</td>
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<tr>
<td>Romania</td>
<td>5.363</td>
<td>3.47%</td>
</tr>
<tr>
<td>Slovenia</td>
<td>1.765</td>
<td>1.98%</td>
</tr>
<tr>
<td>Slovakia</td>
<td>2.379</td>
<td>8.45%</td>
</tr>
<tr>
<td>Finland</td>
<td>4.807</td>
<td>2.48%</td>
</tr>
<tr>
<td>Sweden</td>
<td>8.534</td>
<td>5.74%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>53.298</td>
<td>2.19%</td>
</tr>
</tbody>
</table>

Source: EUROSTAT
Table 'Biofuel Consumption': Biofuels consumption in the transport sector in the EU in 2009 (ktoe)

<table>
<thead>
<tr>
<th>Country</th>
<th>Bioethanol</th>
<th>Biodiesel</th>
<th>Other</th>
<th>Total consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU27</td>
<td>2.339,24</td>
<td>9.616,13</td>
<td>13.75</td>
<td>12.092,62</td>
</tr>
<tr>
<td>Austria</td>
<td>64,24</td>
<td>424,90</td>
<td>13.37</td>
<td>502,52</td>
</tr>
<tr>
<td>Belgium</td>
<td>37,57</td>
<td>221,25</td>
<td>-</td>
<td>258,82</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>0</td>
<td>6,18</td>
<td>-</td>
<td>6,18</td>
</tr>
<tr>
<td>Cyprus</td>
<td>0</td>
<td>15,02</td>
<td>-</td>
<td>15,02</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>51,09</td>
<td>119,81</td>
<td>-</td>
<td>170,90</td>
</tr>
<tr>
<td>Denmark</td>
<td>3,91</td>
<td>0,243</td>
<td>-</td>
<td>4,15</td>
</tr>
<tr>
<td>Estonia</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Finland</td>
<td>79,32</td>
<td>66,28</td>
<td>-</td>
<td>145,60</td>
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<td>France</td>
<td>455,93</td>
<td>2,055,55</td>
<td>-</td>
<td>2,511,49</td>
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<tr>
<td>Germany</td>
<td>581,68</td>
<td>2,224,35</td>
<td>88,37</td>
<td>2,894,40</td>
</tr>
<tr>
<td>Greece</td>
<td>0</td>
<td>57,44</td>
<td>-</td>
<td>57,44</td>
</tr>
<tr>
<td>Hungary</td>
<td>64,48</td>
<td>119,80</td>
<td>-</td>
<td>183,79</td>
</tr>
<tr>
<td>Ireland</td>
<td>19,73</td>
<td>54,26</td>
<td>-</td>
<td>73,99</td>
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<tr>
<td>Italy</td>
<td>118,01</td>
<td>1,046,98</td>
<td>-</td>
<td>1,167</td>
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<tr>
<td>Latvia</td>
<td>1,12</td>
<td>3,57</td>
<td>-</td>
<td>4,69</td>
</tr>
<tr>
<td>Lithuania</td>
<td>14,99</td>
<td>37,77</td>
<td>-</td>
<td>51,86</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>0,74</td>
<td>39,91</td>
<td>0,49</td>
<td>41,15</td>
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<tr>
<td>Malta</td>
<td>0</td>
<td>0,583</td>
<td>-</td>
<td>0,58</td>
</tr>
<tr>
<td>Netherlands</td>
<td>138,65</td>
<td>228,88</td>
<td>-</td>
<td>367,53</td>
</tr>
<tr>
<td>Poland</td>
<td>136,04</td>
<td>566,99</td>
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<td>703,04</td>
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<tr>
<td>Portugal</td>
<td>0</td>
<td>231,47</td>
<td>-</td>
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<td>53,27</td>
<td>131,32</td>
<td>-</td>
<td>184,60</td>
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<td>55,04</td>
<td>-</td>
<td>61,86</td>
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<td>27,99</td>
<td>-</td>
<td>29,85</td>
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<tr>
<td>Spain</td>
<td>152,19</td>
<td>894,33</td>
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<td>1,046,52</td>
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<td>Sweden</td>
<td>199,44</td>
<td>159,77</td>
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<td>354,23</td>
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<td>United Kingdom</td>
<td>159,00</td>
<td>822,87</td>
<td>-</td>
<td>981,87</td>
</tr>
</tbody>
</table>

Source: Euroobserver, 'Biofuels Barometer 2010'
2.3. **Energy Policy**

The European Policy category analyzes how ambitious the NREAPs, the appropriate measures proposed by country and the political will to develop the RES-sector are. On the basis of these results, the Cross Border Bioenergy consortium scores the EU countries as depicted in the map below.

The expansion of the biofuel market is almost entirely politically driven, making it very dependent on policy instruments. There are two main driving directives for the biofuel market in Europe. The Renewable Energy Directive (RED)\(^1\) set the target of 10% renewable energy in the transport sector by 2020 and implemented the sustainability criteria for biofuels. Furthermore, it contains the rules for GHG calculation methods and double counting for advanced biofuels. This directive is the main driving force for the whole development of biofuels in Europe, both conventional and advanced. There have been complaints and heavy debates regarding the climate gains of this directive. Critics say that it is a volume target with a low threshold and is not promoting fuels with high GHG savings. Another criticism is that the directive’s mechanisms – double counting and bonuses for growing feedstock’s on degraded land – are not sufficient for promoting biofuels with high GHG savings and initiating investments in advanced biofuels. There has also been a strong debate regarding the ‘fuel vs food dilemma’, stating that the targets for biofuels within the EU are too high, even though there is enough idle land available within the EU-27 zone to meet the additional feedstock demands. At the same time the directive has implemented sustainability criteria for biofuel and has thereby given a large market boost for sustainable biofuels.

A second directive that could in the near future have a significant impact on the development of biofuels is the Fuel Quality Directive (FQD)\(^2\). This directive was developed as a mirror directive to the

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2. DIRECTIVE 2009/30/EC - amendment to Directive 98/70/EC on environmental quality standards for fuel
should be performed within the directive are still ongoing. Until the FQD is fully implemented there will be a lack of a well functioning market instrument to promote advanced biofuels with a high GHG benefit within EU-27. The RED double accounting mechanism has so far not proven to be strong enough to support large-scale investments in advanced biofuels, as this mechanism is primarily focused on member states.

The energy tax directive is an additional directive that affects the flexibility of the incentive structure for the biofuel market as it limits the way tax exemptions and support mechanisms for biofuels can be introduced. This directive is under renewal and a new directive was supposed to be in place by 2013. However, due to internal conflicts within the member states regarding the change...
from a single fuel tax to a divided energy and carbon tax on fuels the directive has been delayed. Consequently no deadline for this new directive has been announced so far.

Another problem is the lack of rules or targets for vehicles that can be run on biofuels within the EU legislation for light and heavy traffic. Unfortunately today’s rules are rather a barrier for the introduction of biofuels that require engine adaptations, such as E85, B100, ED95, Biogas, and so forth. One major issue is that CO₂ emissions from vehicles adapted to these fuels are calculated as if they were driven on fossil fuels. As many of these engines are adapted for multiple fuels, both renewable and fossil, their efficiency is sometimes lower leading to somewhat higher emissions when driven on fossil fuels. The BEST project³ has shown that there are still many legislative barriers for introduction of high blend bio-alcohols within Europe. The same goes for new fuels such as i.e. bio-DME.

There has been a large policy debate concerning Indirect Land Use Change (ILUC), demanding for a legislation dealing with this problem in Europe, by setting an EU-wide GHG factor for ILUC for all biofuels, that are produced from feedstocks where an ILUC effect can be assumed. This is a very controversial debate since no uniform scientific outcome has been reached yet. There is a consensus that under certain circumstances, such as a too rapid biofuel market expansion following rapidly increasing fossil prices without supporting investments for food production in food insecure regions, there might be an ILUC effect. However, the debate must include the magnitude of this effect, the type

of biofuel and the region in question.

The Common Agricultural Policy (CAP), that is right now being revised, will also have a large effect on the future feedstock situation for biofuels for transport, both regulating available lands as well as giving incentives to grow both, dedicated bioenergy crops as well as today’s major feedstock for conventional biofuels. The suggested targets for set aside agricultural land for green development – 5% of the total holding of 127 million ha (6.4 mio ha) – is for instance larger than the estimated additional agricultural area needed (5.2 mio ha) to meet the EU-2020 target for the transport sector. The outcome of the debate on set aside lands and other incentive measures within the CAP will significantly affect the feedstock availability within the EU 27.

The possible inclusion of an ILUC regulation, the public debates on whether the 2020 target for the transport sector is set to high, the legislative barriers for fossil independent technologies, as well as a lack of agreement on the FQD and the energy tax directive significantly dampen the market growth of biofuels in spite of the ambitious targets for the transport sector. Furthermore, this lowers national policy makers will to increase their incentives for biofuel development as the central directive and guidance is lacking.

There are some major trends in the policy development of the biofuel sector:

- **Tax exemptions for biofuels**: EU-wide, this has historically been the mostly used incentive. The incentive has, when the tax exemption has been large enough, shown great results concerning the market development. However, many governments considered this incentive as too expensive for the state, especially when the market share of biofuels increased.

- **Quotas**: This is the most popular incentive amongst EU members today and it is almost entirely used for the low blend market. For this purpose usually a mandatory quota is introduced to the market, with a full or partial tax on the biofuels within the quota. The cost of the biofuel introduction is hereby placed on the market actors rather than on the state. However, quotas are often not liked by the biofuel producers as it creates an over regulated market that cannot grow organically. In some EU member states quotas allow for market actors to use the double counting mechanism introduced for the national reporting of the state towards the 2020 targets.

- **Feed-in tariffs**: This is not a common incentive within the EU but it has been discussed as a way to support the increased production of advanced and internally produced biofuels.
2.4. Feedstock Potential

This category analyzes the biomass potential for the development of biofuel projects. The graph above shows the scores for all EU countries.

The largest traditional and agricultural feedstock potential can be found in the southern and eastern parts of the EU27, especially in the eastern part where there are large areas of not fully utilized agricultural lands. The same goes for the forest feedstock potential that remains strong in the middle, northern and eastern parts of Europe that are more forested.

As shown in table ‘Biofuel Consumption’ the major feedstocks for biodiesel in Europe have changed, showing the increased imports of biodiesel. The major feedstocks for ethanol in Europe are sugar beet, coarse grain, and a smaller percentage of wheat. Today there is a deficiency in the data available for feedstock utilisation within the biofuel sector, which is based on a lack of data on imported feedstocks. However, as the sustainability criteria for biofuels are being implemented EU-wide, these statistics will be improved as the regulation requires that more information regarding the products, such as origin, feedstock, GHG emissions and so forth, is reported to the authorities.

The number of agricultural holdings within the EU-15 have been declining at an annual rate of 2.2% between 1995 and 20074 indicating both an aggregation of farms but also a reduction of activity in the agricultural sector due to lack of profitability. This will affect the future feedstock production as a decline in active farmers might lead to a decline in

4 www.eurostat.eu
Table 'Land Use': Agricultural Land use, 2009

<table>
<thead>
<tr>
<th></th>
<th>UAA-utilized ag. areas</th>
<th>UAA</th>
<th>Arable land (%) of Total land area</th>
<th>Land under permanent crop</th>
<th>Land under permanent grassland</th>
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<td><strong>Malta</strong></td>
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<td>4</td>
<td>0</td>
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<td><strong>Poland</strong></td>
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<td>10</td>
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<td><strong>Portugal</strong></td>
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<td>1</td>
<td>14</td>
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<td><strong>Sweden</strong></td>
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<td><strong>United Kingdom</strong></td>
<td>17.71</td>
<td>65</td>
<td>23</td>
<td>0</td>
<td>42</td>
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</tbody>
</table>

Source: Eurostat - Statistical Pocketbook 2010
agricultural lands under production leading to a decline in total yields from the agricultural sector. This could lead to increased competition on feedstocks and therewith increasing feedstock prices. However, the active agricultural area of the EU-15 has not declined at the same rate, but only by 0.3 % annually between 1995-2007. According to Eurostat the total area of agricultural lands within the EU-27 was 172 million ha in 2007. 68 % of this agricultural area was used for arable crops. It is estimated that, with current production methods, 5.2 million ha of agricultural lands are needed to meet the 2020 target for the transport sector. If the production efficiency increases and other substrates, such as straw, become available for the biofuel production the yield potential will increase and the area demands therewith will decrease. There is moreover not fully utilized agricultural land available for increased agricultural use to meet the demands of increased biofuel production within Europe.

To promote the agricultural sector within Europe and keep farmlands active and profitable, the additional market of feedstock production for biofuels will be a way to increase job opportunities in the rural areas of the EU-27. To receive a general overview of the feedstock potential in the different member states please consider Table ‘Land Use’ providing information regarding agricultural land use in 2009.

5 www.eurostat.eu
2.5. **Business Cases**

The business case analyzes the price levels, subsidy guarantees and support schemes that can affect the viability of specific bioenergy technology applications. In the Figure 'Business Case', the scores of all EU countries in this category are shown.

As stated above the biofuel market is largely politically driven. This has the effect that the political turmoils regarding sustainability issues, target ambitions, and fiscal incomes from fuel tax make the market less stable. In contrast, investments in new production capacity require long term stability on the market for at least 15 years from project start. This means that the 2020 target needs to be complemented with 2030, 2040 and 2050 targets so that market actors can include these long-term policy goals into their decisions. Before definitions and resolutions to the conflicting issues of ILUC and FQD are found, investments into EU markets will only be hesitant. This could lead to an increased dependence on biofuel imports to the EU-27. At the same time, however, the installed biodiesel and bioethanol production plants in Europe are only producing at half of their capacity. The same situation is also reported by ePure (European renewable ethanol association) and EBB (European Biodiesel Board) leading to the conclu-

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6 Aebiom 2011 Annual statistical report on the contribution of biomass to the energy system in EU27
sion that it is currently hard to achieve profitability in biofuel production within the EU. Nevertheless, additional plants are still being built in some regions. The reason for this is that the major policy focus lies on improving investments in advanced biofuels and introducing new feedstocks, which will, however, be hard to achieve without a stable policy framework and a clear incentive structure that also promotes GHG savings. At the same time the demand for biofuels within the EU and also globally will continue to increase. This increasing demand as well as rising crude oil prices will make cost efficient biofuel production plants profitable in the medium and long term period, if they can compete with world market prices and proof the sustainability of their product.
2.6. Market Environment

The graph below shows the EU countries’ scores based on the analysis of the energy market dimensions in these countries. Here, the consortium of the Cross Border Bioenergy project analyzes the energy market, transferable technologies, as well as logistics and access to the customer base through established networks.

The market potential for biofuels within the EU-27 is huge. The amount of fossil fuels that needs to be replaced within the coming decades is so large, that there is no need for internal competition between biofuels. Fossil fuels will remain the main competitor for biofuels for a long period to come. In the short term, to reach the 2020 target, the amounts of biofuels that need to enter the market must increase rapidly over the coming years.

In spite of the expected huge increase of biofuel usage within the EU there is still a large overcapacity of biofuel production plants within the EU, as seen in Table ‘Capacity and Production’. Most of this production capacity lies in biodiesel plants. This is based on the fact that the production price level is not competitive in light of the changed policy incentives and the shrinking B100 market. Furthermore, imports of biofuels to Europe are increasing which leads to a stronger price competition on the market.

There are several factors behind this pattern, apart from an increased competition from imports. The rate of the market expansion of biofuels has declined to some extent in the aftermath of the intense policy debate on ILUC, Food vs Fuel, CAP and due to a lack of stee-
The production of E10. The public debate has lead to the notion that biofuels might lead to engine problems and increased food shortage. This shows that there is a strong need for public information regarding the benefits of biofuels both for the climate and the economy of the EU.

Furthermore, the financial crisis in the EU hinders large capital investments and reduces the governments’ will to try new energy policy paths. Another factor is public will to use renewable biofuels. There has been large public scepticism towards biofuels, with protest accompanying the introduction of E10. The public debate has lead to the notion that biofuels might lead to engine problems and increased food shortage. This shows that there is a strong need for public information regarding the benefits of biofuels both for the climate and the economy of the EU.

### Table: Capacity and Production of Biofuels in 2009 in the EU MS

<table>
<thead>
<tr>
<th>Country</th>
<th>Capacity (million tons)</th>
<th>Production (million tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
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<td>0.310</td>
</tr>
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<td>Belgium</td>
<td>0.700</td>
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<td>Bulgaria</td>
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<td>0.025</td>
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<tr>
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<td>0.009</td>
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<td>0.164</td>
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<tr>
<td>Denmark</td>
<td>0.140</td>
<td>0.233*</td>
</tr>
<tr>
<td>Estonia</td>
<td>0.135</td>
<td>0.024</td>
</tr>
<tr>
<td>Finland</td>
<td>0.340</td>
<td>0.220</td>
</tr>
<tr>
<td>France</td>
<td>2.505</td>
<td>1.959</td>
</tr>
<tr>
<td>Germany</td>
<td>5.200</td>
<td>2.500</td>
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<tr>
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<td>0.715</td>
<td>0.077</td>
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<tr>
<td>Hungary</td>
<td>0.168</td>
<td>0.133</td>
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<td>Ireland</td>
<td>0.080</td>
<td>0.017</td>
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<td>0.737</td>
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<td>0.136</td>
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<tr>
<td>Slovenia</td>
<td>0.100</td>
<td>0.090</td>
</tr>
<tr>
<td>Spain</td>
<td>3.656</td>
<td>0.859</td>
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<tr>
<td>Sweden</td>
<td>0.212</td>
<td>0.233</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.609</td>
<td>0.137</td>
</tr>
</tbody>
</table>

* Including Sweden

Sources: European Commission/National biofuels reports, UFOP/European Biodiesel Board
Already today there is active trade between member states and non member states. This means that there are logistic and economic operators available to facilitate internal EU trade. The introduction of official trade places has also increased the market transparency. However, due to the non-harmonized fuel standards and regulations as well as the large differences in incentives structures in the EU, it is hard for new market actors to get a comprehensive overview of the market conditions in different member states.
2.7. Regulation

This category refers to additional mandates, rules and authorisation procedures that impact the stability and practicality of operations in the bioenergy industry, such as efficiency standards or pollution limits. This category was only analyzed in those countries that participated in the Cross Border Bioenergy project consortium: Austria, Germany, Denmark, Hungary, Latvia, Finland, Italy, Sweden and Slovakia. Estonia, Lithuania, Slovenia and Romania were also analyzed but in less detail.

![Graph showing scoring of 'Regulation' in various countries]

Scoring ‘Regulation’

In all country reports of the CrossBorderBioenergy project the experts report a positive signal regarding the handling of permits for new production sites. Furthermore action is undertaken to harmonize the environmental regulations in the EU-27. This means that obtaining the permits for biofuel production sites is not a limiting factor to market growth. However, as harmonized regulations regarding sustainability are still lacking, apart from the voluntary certification systems, agricultural support systems, availability of project financing, and the incentive structure for the transport sector, it still requires a fair amount of research before a decision concerning an appropriate site for a production unit can be taken.

More information on EU regulations affecting the biofuels market can be found in the sub-chapter ‘Energy Policy’. 
2.8. Project Financing

This category addresses elements of export feasibility, such as a good credit market in the country, good conditions as a target for export as reflected in the Euler-Hermes Rating for instance. The graph below shows the scores for all EU countries.

Many companies in the biofuel sector perceive that the unclear policy situation regarding incentives and regulations makes project financing more difficult. Moreover, to acquire a high percentage of funding for new projects, many member states demand the project to have novelty character and most preferably to lead to a broader feedstock use.

The principal debt financier in the European renewable energy sector has been the banking sector. A few projects had access to debt capital markets but the depth of the European institutional markets is relatively low compared to the US institutional market, where projects in the energy and infrastructure sector usually access the debt capital markets. The situation has been exacerbated by the impact on the monolines. Almost all previous capital market issuances in the renewable energy sector have been insured by the monolines insurers who had AAA credit ratings. Therefore the investors in the capital market debt issued by renewable energy projects, benefited from the AAA credit ratings of the monolines and took substantial comfort from those ratings without having to review the complex renewable energy project structures. Post-crisis, most of these monolines have lost their AAA
credit ratings thereby removing a source of insurance cover that the debt capital market investors can take comfort from. As the result of the financial crisis from mid 2008 onwards, the multilateral banks such as the European Investment Bank (EIB) have filled a void on the project finance market and significantly increased their involvement in supporting RES projects. As an example, the EIB’s loans to the RES sector reached over €4 billion in 2009.

Capital availability from banks in the RES sector is influenced by a number of factors:

1. Capacity of banks to issue long-term credits to the renewable energy sector;
2. Ability of banks to recycle that loan capital through secondary loan markets to other long term institutional lenders such as pension funds, insurance funds or other capital markets;
3. Impact of bank regulations on asset-liability mismatches.
2.9. Readiness for Uptake

This category was only analyzed for the countries partners of the CBB project. It includes the availability of support these countries have, such as industry associations and it also reflects the reality of the potential customer base in terms of awareness, willingness to adopt the technology and information about the maturity of the market.

The readiness for uptake depends largely on the stakeholders and fuels to be discussed. Ethanol and Biodiesel for low blend below 5% are not as controversial to policymakers as blends exceeding 5%. As these higher blends require the information of the public about the lacking compatibility of some engines with the fuels, this could lead to the assumption that the higher blended fuels might be bad for all vehicles.

The same goes for fuel standards. Blends under 5% comply with all member states fuel standards. Blends over 5% and E85 as well as ED95 lack the approval of fuel standards in many member states, which leads to difficulties in introducing these blends into the market.

When it comes to high blends or pure biofuels such as ED95, E85, and B100, these fuels require instalments of special pumps and a separate fuelling logistic parallel to the fossil fuels. This is a big hurdle for the introduction of these fuels as investments in fuelling logistics often require public funds. And before a nationwide fuelling network is in place it is hard to achieve a strong enough mar-
ket penetration. The market readiness for these high blend fuels is therefore much lower than that of the low blend market.

An in the policy discussion often forgotten but very important stakeholder group is the current and future buyers of renewable biofuels. There has been a large public scepticism towards biofuels, lately especially in Finland and Germany with protest accompanying the introduction of E10. Without public support of the transition to a sustainable transport sector biofuel will have a hard time to find customers and achieve a large market penetration.
Austrian Biomass Association (ABA)
Christoph Rosenberger
Franz Josefs-Kai 13
A-1010 Wien
Tel.: +43-1-533 07 97 25
Email: rosenberger@biomasseverband.at

3.1.1. Country Score

In the general scoring for sector, Austria - Upper Austria is rated place 49 out of total 81. The underlying categories that influence this result are displayed in the bar chart.

Source: http://www.crossborderbioenergy.eu

In the general scoring for sector, Austria - Upper Austria is rated place 59 out of total 81. The underlying categories that influence this result are displayed in the bar chart.

Source: http://www.crossborderbioenergy.eu
3.1.2. Basic Data

Austria is a democratic republic. All of the political institutions established by the constitution are elected in three elections: Citizens vote for the Federal President, the National Council and the Provincial Parliaments.

The country consists of nine federal states (see Graph ‘Map Austria’). The capital and largest city is Vienna. Austria has a land area of 83,879 km² (573 km between the western and easternmost points of Austria, the longest north-south stretch totals 294 km) and is thus somewhat smaller than Portugal and Hungary, and somewhat larger than the Czech Republic. Located in the southern part of Central Europe, the Republic shares borders with Germany and the Czech Republic in the north, the Slovak Republic and Hungary in the east, Slovenia and Italy in the south, and Switzerland and Liechtenstein in the west.

8.4 million Austrian inhabitants were counted at the beginning of 2011. By 2050, the figure should reach ca. 9.4 million, according to projections. The municipality with the largest population is Vienna, which had 1.7 million residents at the beginning of 2011. A fifth of Austria’s population, thus, lives in the federal capital, followed by the provincial capitals Graz (262,000 residents), Linz (189,000 residents), Salzburg (148,000 residents), and Innsbruck (120,000 residents).

Austria’s weather is characterized by a transitional climate. Consequently, an oceanic climate with moist westerly winds predominates in western Austria. Further to the east, the climate becomes increasingly continental with decreasing

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Graph ‘Map Austria’: Austria as a federal state

Source: Statistics Austria: Austria – data, figures, facts, Vienna, 2011
precipitation, hot summers, and cold winters. In addition, the local climate is strongly influenced by the altitude, local topography, and exposure to the prevailing westerly weather conditions.

**Useful links:**
- ÖNACE – Austrian classification of economic activities of companies
- Statistics Austria

### 3.1.3. Energy Policy

As a contracting party of the Kyoto Protocol, the EU is obliged to reduce its GHG emissions in the period from 2008 to 2012 by 8% compared to the Kyoto base year of 1990. Austria has to reduce its emissions, according to the EU internal burden-sharing, by 13%. In the year 2009, GHG emissions in Austria reached 80.1 million tons. Thus, the emissions of the year 2009 were 11.3 million tons above the allowable average from 2008 to 2012 of the established Kyoto target. In consideration of the emissions trading, Joint Implementation and CDM projects, and the balance from afforestation and deforestation, the deviation from the target adds up to about 5 million tons of CO₂-equivalents. Hence, the over-all gap from the years 2008 and 2009 amounts to 11.9 million tons of CO₂-equivalents. To keep the gap as small as possible the implementation of effective domestic measures is necessary.

Hence, Austria is bound to
- reduce its GHG emissions by at least 21% in the sectors covered by the emissions trading system, and by 16% in those sectors that are not covered by the emissions trading system
- increase the share of RES of the total energy consumption to 34% – the share in the transport sector should be at least 10%.
- to reduce total energy consumption by 20% of the prognosticated level of the year 2020 by improving energy efficiency.

The Table ‘Consumption Bioenergy’ shows the development and the expectations of bioenergy consumption in Austria from 2005 to 2020.

Austria plays a pioneering role in the use of biofuels in the EU. Through tax incentives and blending obligations already 7% of fossil fuels had been replaced by biofuels in 2009. This exceeded the replacement target, which was set at 5.75%. The EU directive to promote renewable energy requires 10% of renewable energy in the transport sector by 2020. The EU directive on fuel quality forces the Austrian fuel suppliers to reduce greenhouse gas emissions by about 6% by 2020.

The most important measures for a further establishment of biofuels are:
- Biodiesel and bioethanol: As a key contribution to achieve Europe’s goal of 10% RES in transport in 2020, E 10 and B 10 (10% ethanol or biodiesel mixed to fossil fuels) will be introduced in Austria based on a European standard (E 10 in 2012, B 10 will be introduced in 2017).
- Other biofuels: In addition to blend biodiesel and bioethanol into fossil fuels,
the use of pure biodiesel (B100), bioethanol (E85 - super ethanol), vegetable oil, and biomethane as fuel should be promoted. Corresponding tax incentives and targeted programs need to be implemented.

- Second generation biofuels are still in the research and demonstration stage. No significant contributions are expected from second generation biofuels based on solid biomass (e.g. wood, straw, etc.) until 2020.

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**Table 'Consumption Bioenergy': Consumption of Bioenergy in Austria – Development & Potential from 2005 to 2020**

3.1.4. Feedstock

The forest cover is particularly high in Austria: Almost half (47.6 %) of the area is covered by forest. This reflects 3.99 million ha or 39,926 km² of the Austrian Republic. National agriculture and forestry not only forms the backbone of a viable rural community, but also reflects the cultural tradition of the nation. Structural changes to the economy have obviously had an impact on agriculture and forestry: As in most other EU member states, a steady downward trend in the number of operations accompanied by a simultaneous increase in the average size of the operations. The total output of agriculture and forestry accounted for €8.0 billion in 2010. The Table ‘Land Use’ shows the distribution of the land use in Austria, subdivided to the federal states. The agricultural sector plays an indispensable role. Among other things, it ensures nutritional produce, preserves the cultural landscape, is a substantial part of landscape management, and maintains its function as an energy source. Sustainable agriculture and the specialization on agricultural and forestry operations has made Austrian agriculture competitive on the EU-level. The coupling of agriculture and forestry with the tourist industry, and the increasing cultivation of energy crops to promote sustainable raw materials, guarantees the conservation of economically healthy, productive, farmer-oriented agriculture and forestry in a functional rural community.

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Table ‘Land Use’: Percentage of land use in Austria 2010

<table>
<thead>
<tr>
<th>Federal state</th>
<th>Area. in km²</th>
<th>Agricult. use</th>
<th>Forests</th>
<th>Alps</th>
<th>Inshore waters</th>
<th>Other (^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burgenland</td>
<td>3 962</td>
<td>48.6</td>
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<td>-</td>
<td>7.4</td>
<td>5.7</td>
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<td>12.7</td>
<td>1.9</td>
<td>10.3</td>
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<td>Lower Austria</td>
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<td>0.2</td>
<td>1.3</td>
<td>5.0</td>
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Source: Federal institution of Statistics Austria: Facts & Figures – Annual edition 2011; 1) Land use per usage type according to Kataster of the Federal Office for Metrology and Surveying; 2) Built-up areas, gardens, vineyards and other areas
In addition to raw materials from forests and timber processing industries, domestic wastes and agricultural feedstocks will gain more importance. These raw materials can be used for the production of solid biomass, biogas and biofuels. In 2009 about 46,500 ha of arable land and grassland in Austria were used for the production of biomass, with a strong dominance of energy crop cultivation on arable land (46,000 ha). This corresponds to 3.4% of total arable land in Austria. Until 2020, the cultivation of energy crops as a main crop could be extended to 122,000 ha. 80% of this extension would be on arable land and 20% on grassland. This corresponds to 7.2% of arable land and 1.4% of grassland. In addition, catch crops can be produced on 23,000 ha, and harvesting residues can be taken from 150,000 ha. The increased use of biomass wastes and residues from agriculture, such as dung, also provide additional energy potential.

In 2009, 25,000 ha of oilseeds (rape-seed, sunflower, etc.), which are used as raw materials for biodiesel and vegetable oil were grown in Austria. Until 2020 this area could increase to 50,000 ha, and the vegetable oil and biodiesel production could respectively double to 1.8 PJ by 2020. The by-product of ethanol can be used as protein feed, which diminishes the required net area for bioethanol production to 10,000 ha in 2009 and to 20,000 ha in 2020 respectively. In 2009, 40,000 ha of cereals and corn were needed for the domestic bioethanol market. This area could increase to 80,000 ha by 2020 and, thus, the bioethanol production could be doubled from 2.7 PJ in 2009 to 5.3 PJ in 2020. As mentioned above, the by-product of ethanol can be used as protein feed, which diminishes the required net area for bioethanol production to 10,000 ha in 2009 and to 20,000 ha in 2020 respectively.4

3.1.5. Business Case

The Austrian fuel consumption has been rising rapidly since the mid 1980s and marketed 8.34 million tons or approximately 357 PJ in 2005. Since then, only a slight decrease of the market has been observed. The demand for diesel, in particular, has more than quadrupled over the past 20 years. Since 2005, it has become mandatory to mix fossil fuels with biofuels (EU-Directive 2003/30/EC). The application of biofuels has grown from 2.7 PJ in 2005 to 22.5 PJ in 2009 (Figure ‘Land Use’). In 2009, Austria utilised 19.2 PJ of biodiesel, 2.7 PJ of bioethanol, and 0.7 PJ of plant oil. A share of 78% of the biodiesel was utilised for the mandatory admixture to fossil diesel, the remaining 22% in purified forms, and other mixtures. Bioethanol was primarily used in addition to fossil petroleum, while plant oil was used in purified forms (see Figure ‘Energy Consumption’).

In 2010, 14 biodiesel plants with an approximate annual output capacity of 650,000 tons were installed in Austria. Subsequently, the biofuel admixture obligation was easily covered by Aus-

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Figure 'Fuel Consumption': Fuel consumption in Austria 1970-2009. The final energy consumption of the following resources: petrol, biodiesel (admixture), bioethanol (admixture) and other biogenic fluids (pure biodiesel and vegetable oil). The final consumption includes all sectors (domestic, agriculture, manufacturing, traffic, public and private services).


Figure 'Energy Consumption': Energy Consumption in Austria in the Traffic Sector 2009. The Traffic excluding railroad, shipping, air traffic and transportation in pipelines.

Figure 'Biofuel Production': Biofuel Production in Austria 2003–2010

Source: Environment Agency Austria; publication: 'Basic Data Bioenergy 2012'; published by Austrian Energy Agency and Austrian Biomass Association

Graph 'Production Sites': Biofuel Production Sites in Austria 2009

trian production. In addition, the annual production capacity of 240,000 m³ (~190,000 t) bioethanol in Pischelsdorf/Lower Austria covers the entire national demand for bioethanol (Figure ‘Biofuel Production’). The Graph ‘Production Sites’ gives an overview of the biofuel production sites in Austria in 2009. The primary resources for the production of bioethanol are wheat- and corn surpluses from Central and Eastern Europe, crops that are not usable for food production.

Bioethanol:

E10, fuel with a share of 10% biofuel from grain, should be introduced in Austria in autumn 2012. Currently there is one plant in Austria – belonging to AGRA-NA, placed in Pischelsdorf, Lower Austria – that produces bioethanol from wheat and corn. The current production of maximal 240,000 m³ already covers the demand for E10 in Austria. The currently produced bioethanol surplus is exported to neighbouring EU countries. Hence, the production of E10 for the domestic use will not consume further agricultural land. The raw material mainly stems from structural wheat and corn overproductions from Eastern Europe, as well as from grains that do not reach the quality standards for food production.

In Austria 32% of the cropland is currently used for food production, 47% for feed production, and 8.5% for the production of biofuels. During the bioethanol and biodiesel production, protein rich feed accumulates as a by-product. This reduces the domestic cropland for feed production by about 6,000 ha and furthermore substitutes the soy imports from South America – which are partly genetically modified – by 59,000 ha. Taking the above named benefits into account, only 1.5% of the domestic cropland is used to produce biofuels.

Food production has always had the highest priority in Austria. Even in the long term the cropland dedicated to food production will always exceed the cropland used for energetic purposes. However, there will always be cropland that is less suitable for food production and can therefore be used to produce energy plants.

Currently, bioethanol is admixed to fossil fuels with a share of 5%. Only ‘FlexFuel-Vehicles’ can use E85, the ‘pure’ form of bioethanol (in Austria superethanol consists of 85% bioethanol and 15% fossil fuels). Through the drying of the distilled mash, high quality protein rich feed is produced as a by-product, which can be used as cow fodder. It could substitute one third of the currently imported soy.

Biodiesel:

To use the admixture of about 7% of bioethanol to fossil diesel, vehicles do not need a special engine. Hence, this admixture is regularly used in Austria. The usage of higher admixtures must be approved by the fabricator. Currently ‘pure’ biodiesel is limited to the transportation sector. A further potential lies in underground working and mining as well as in inland shipping.
### 3.1.6. Market Environment

The consumption of bioenergy increased by about 30% from 140 PJ in 2005 to 182 PJ in 2009 (see Figure ‘Development Energy Consumption’). The heating market is the main sales market for biomass with a share of 79%, followed by the biofuel market with 12.4%, and the green electricity market with a share of 8.6%. Assuming that the potential of resources will be exploited, the final consumption of bioenergy could rise by about 31% up to 237 PJ. With an estimated share of 76%, the heating market will still be the primary field of use for biomass in 2020. A share of 15% of biofuels and a share of 9% of green electricity from biomass and biogas are assumed.

The use of biofuels rose from 2.3 PJ in 2005 to 22.5 PJ in 2009. In Austria 18.9

### Vegetable oil:

The usage of pure vegetable oil as fuel is currently not important. However, since its by-products can be used as feed, it continues to receive some attention. Especially in sensible ecosystems (e.g. water protection areas, ski slopes, and forests) applications of fuels based on vegetable oil should be considered.

### Second generation biofuels:

Fluid and gaseous fuels of the second generation can be produced through thermal gasification or through oil production. Other possibilities for ethanol production from cellulose-containing biomass are thermal and enzymatic processes. Despite all knowledge, there is still a huge research potential to improve methods. Especially the up-scaling of processes is a central matter.

![Figure 'Development Energy Consumption': Development of final energy consumption of biomass in Austria from 2005 to 2009 and forecast potentials for 2020](image)
PJ biodiesel, 2.7 PJ bioethanol, and 0.7 PJ vegetable oil have been used. 78% of the used biodiesel have been mixed with fossil fuels (according to the legal regulatory admixture), and 22% have been used purely or in other mixing ratios. Bioethanol was mainly used in mixtures, vegetable oil in pure form.

Following the EU directive, the usage of biofuels could rise by about 59% to 35.7 PJ. In 2020 28.7 PJ biodiesel, 5.3 PJ bioethanol, 1.1 PJ vegetable oil, and 0.6 PJ biogas could be used. Bioethanol, vegetable oil and biogas can be produced in Austria (see Figure ‘Development Biofuels’). Besides the domestic production, biodiesel must be imported from other European countries. Especially farmland in Eastern Europe offers potential for the growth of energy plants. The importance of biofuels based on solid biomass will still be relatively small in 2020.

### 3.1.7. Regulation

Binding objectives for the usage of biofuels in the transportation sector after 2010 have been defined in the EU-Directive on the promotion and use of energy from RS. According to Directive 2009/28/EG, the member states need to substitute at least 10% of the used energy in the transportation sector with energy from RS. Biofuels from the first and second generation that fulfil all criteria of sustainability as well as electricity from renewable energy sources can be used. To fulfil the criteria, biofuels need to offset a certain amount of GHG, and meet certain restrictions for the...
Regardless, the transportation sector develops in the opposite direction. Between 1990 and 2010 the positive emission reductions of industries and trade, heating, small-scale consume, agriculture, and waste management was offset by the increasing emissions (increase of 60%) of the transportation sector. After a periodic decrease of GHG emissions from the transportation sector due to the use of biofuel admixtures as well as the economic depression in 2009, the Environment Agency Austria expects emissions from the transportation sector to rise once again. According to the Environment Agency Austria the existing measures are not efficient raw material cultivation. Ecologically important areas with a high carbon stock e.g. primary forests, marshlands, and greenland with a high biological diversity cannot be used to produce raw material for energetic purposes. Certain fuels like biodiesel gained from old vegetable oil or bioethanol from straw are weighted twice. Green-electricity that is used in the transportation sector and for trains, is weighted 2.5 times. Thus an incentive for especially eco-friendly energy and cascading use should be created.

According to the EU, Austria needs to reduce its CO₂-emissions by about 16% until 2020 compared to 2005-levels.

Figure 'GHG Emissions': Development of Greenhouse Gas Emissions and Million t CO₂ equivalents in Austria from 1990 to 2010 and changes in emissions between 1990 and 2010 (in million tons) in Austria

enough to reduce the emissions significantly. Nevertheless, the increased use of biofuels is an important measure to reach the objectives. In 2009, 1.7 Mio tons of CO\textsubscript{2} equivalent less were emitted. Without a change in the transportation sector towards an increased use of biofuels, the objectives cannot be reached.

While the areas of small-scale emissions, agriculture, waste management, energy production, fluorinated gases and other emissions were able to moderate the amount of their emissions, the sector of transportation shows an increase of 0.6 million tons compared to 2009, and the industry experienced a significant increase of 14 million tons (see Figure ‘GHG Emissions’).

According to outcomes from recognized rating agencies like Standard & Poor’s\textsuperscript{5} and Moody’s,\textsuperscript{6} Austrian markets can be considered as safe from a country risk perspective and also the reliability and credit worthiness of the Austrian economy is rated with best scores.

COFACE country risk rating sees Austria on the fifth place of whole Europe after Luxembourg, Norway, Sweden, and Switzerland.\textsuperscript{7} According to Transparency International, Austria took the 16\textsuperscript{th} position of the whole world on the Corruption Perception Index.\textsuperscript{8}

The IFC ranks economies on their ease of doing business. A high ranking on the ease of doing business index means the regulatory environment is beneficial for the starting and operation of a local firm. Austria achieved the 32\textsuperscript{nd} place of 183 viewed countries in the ‘Ease of Doing Business’-ranking. So the ease of doing business is seen to be quite well in Austria, although the rank of ‘Starting a Business’ is relatively low due to very high administrative and regulative requirements.\textsuperscript{9}

As Austria is member of the Eurozone, currency exchange risk within this zone, that is to say for investors coming from other member countries of the Eurozone, is low. The average inflation rate is with 1.8\% for the period 2005 to 2010 one of the lowest within Europe. The European average for the same period is 2.3\%.\textsuperscript{10}

The easiness of getting a credit by banks is very much dependent on individual project designs as banks assess the reliability of the chosen technology, security of feedstock supply, and price risks. The development of appropriate measures or strategies for the use of bioenergy is very specific. The optimal solution for the specific situation must consider ecological, economic, and social aspects.

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\textsuperscript{5} Standard & Poor’s, http://www.standardandpoors.com/home/en/eu
\textsuperscript{6} Moody’s, http://www.moodys.com/
\textsuperscript{8} Corruption perceptions index 2011, http://cpi.transparency.org/cpi2011/results/#CountryResults
\textsuperscript{10} Wirtschaftskammern Österreich, http://wko.at/statistik/eu/Cpa-inflationsraten.pdf
The growth of the renewable energy sector is a success story that will develop further, despite the increasing energy consumption. Energy independence – 100% energy supply from domestic and renewable sources – is the objective for Austria by 2050. Renewable energy sources have a special status in Austria. In recent years big efforts were made to promote green energy. As a result, 30.8% of the Austrian energy consumption came from renewable sources in 2010. The divers measures are on the one hand initiatives sensitizing the public to energy issues (e.g. ‘klima:aktiv’), and on the other hand support schemes in the form of subsidies and suitable framework conditions to promote renewable energies.

The total turnover of investments in renewable energy technologies reached €5,229 billion in 2010, which was a 5.1% increase to the previous year. The production and service of renewable energy appliances employed 37,649 people in 2010 – 5.1% more than in 2009. The importance of renewable energy for the national economy is, however, far bigger than just the turnover and employment effects. The ability to generate energy from domestic sources reduces the need of fossil fuel imports. Hence the national economy will be less prone to crisis and gain sustainability in the long-term.12


Project financing institution:
RENERGIE11 offers support in financing and operation of energy generation facilities using RS, develops projects for renewable power and heat, and realizes the appropriate production plants. The projects are implemented by equity investments in selected EU markets.

3.1.9. Readiness for Uptake
The readiness for uptake of biofuel projects in Austria seems to be good, even though new projects need to be planned and implemented under the participation of local inhabitants and stakeholders.
In 2010, there were 14 production plants for biodiesel with an overall annual capacity of about 650,000 tons. Whilst the available domestic production capacities are sufficient to supply Austrian demand for biodiesel, raw material needed for the production on-site has to be imported. Even if the diesel consumption would decrease significantly, the raw material needed for the production could not be produced in Austria. Most imports are coming from neighbouring countries within a radius of 800km e.g. Slovakia, Hungary, Romania and Bulgaria. In the named countries, huge amounts of raw materials can be sustainably produced, and easily transported on short distances via train or ship. Furthermore, the usage of old vegetable oil will gain importance. Due to ecological, economic and technical reasons almost no raw material from overseas e.g. palm oil will be used now or in the future.

11 http://www.renergie.at/en
3.2. Germany

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3.2.1. Country Score

Country Score Germany Bavaria - Biodiesel (November 2011)

In the general scoring for sector, Germany - Bavaria is rated place 7 out of total 81. The underlying categories that influence this result are displayed in the bar chart.

Country Score Germany Bavaria - Bioethanol (November 2011)

In the general scoring for sector, Germany - Bavaria is rated place 8 out of total 81. The underlying categories that influence this result are displayed in the bar chart.
3.2.2. Basic Data

Germany is with 357,104 km² land area one of the largest countries in Europe. It is located in the temperate climate zone with -0,5 degree Celsius in January and 17 degree Celsius in July on average.¹

52.3% of the surface area is used for agriculture, which offers a great theoretical potential for agricultural feedstock supply for the biofuel industry. Considering a total population of 81 million inhabitants, Germany comprises 2,300m² available farm land (including grassland), and 1,460m² arable farm land (without grassland) per capita respectively.²

In 2011, about 41.7 million registered vehicles were fueled with 19.2 million tons of petrol fuel and 33 million tons of diesel fuel, which reflects a good market of potential biofuel customers. While the GDP real growth rate stagnated slightly with -0.1% between 2008 and 2010, GDP accounted still €118 per capita in 2010 making Germany to one of the strongest economies in Europe with solvent inhabitants.³

The population density of 229 inhabitants/km² on average is considered to be attractive, providing sufficient sales potential even on the regional scale. Nevertheless, there are differences in real terms due to lower densities in eastern and northern parts of Germany compared to western and southern regions.

Since the road- and rail network is quite dense and in good condition, transportation of feedstock and produced biofuels is feasible all around the year in a modest way.

### Useful links:

Facts and Figures:
- Federal Statistical Office
- EUROSTAT

#### 2.2.3. Energy Policy

Germany aims at having a market share of 6,100 to 6,200 ktoe RES in the transport sector in 2020, corresponding to slightly more than 10%. For this, biodiesel and bioethanol will be the main pillars with 4,443 ktoe (biodiesel) and 857 ktoe (bioethanol). 667 ktoe are thought to be covered by electric mobility while the remaining shares will be covered by biomethane, BtL-fuels, and pure vegetable oils. With a view to an already existing market share of 2,790 ktoe biodiesel and 639 ktoe bioethanol in 2010, further market potential for biodiesel and bioethanol is still considerable summing up to 1,870 ktoe until 2020.⁴

Even though proposed measures to reach the targets are not considered to be sufficient, biofuels for transportation experienced significant changes within the last five years resulting in a tighte-

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² German Farmers Union, www.situationsbericht.de
ned marked situation. Also political will to sustain the biofuel sector with more ambitious targets and a sound support scheme cooled down in recent times due to concerns about the sustainability of biofuels. The 2020-target for RES in transportation had initially been set at 12%; however, it then was lowered to 10%. Also the quota obligation for the mineral oil industry was lowered to 6.25% for the period 2010-2015, even though it had already been fixed at 6.75% for 2010, and was supposed to rise by 0.25% each year until reaching 8% in 2015.\(^5\)

Until 2007, the key support scheme for biofuels consisted in the exemption from the energy tax (formerly mineral oil tax), which boosted the market for pure biodiesel B100 in particular. In 2007, the support strategy changed to rising quota obligations for the mineral oil industry and reduced, but steadily increasing tax rates for pure biofuels. However, even a reduced tax rate as applied today does not allow a competitive marketing of pure biofuels in 2010, so that the market for B100 and PPO stagnated. Reduced energy tax rates for B100 and PPO will only be applied until end of 2012, and from 2013 they will be taxed fully.

The blending of biofuels to fossil fuels will be the main future market in Germany. In 2015, a new support mechanism will be valid, introducing a CO\(_2\)-mitigation quota for fossil fuels, which is to be fulfilled with biofuels, starting with a 3% target in 2015 raising to 7% in 2020.\(^6\)

Since 2011, all biofuels for transportation have to prove their sustainable production according to the regulations of the Federal Office for Agriculture and Food, which is implementing the requirements of RED 2009/28/EC into national law.\(^7\)

**Useful links:**

**Laws and Ordinances:**

- National Renewable Energy Action Plan:
  - BMU - Nationaler Aktionsplan
  - Biomassaktionsplan
  - Transparency Platform - Action Plan
- Energy Tax Law:
  - Gesetze im Internet
  - Biofuels Quota Act (within Federal Immission Control Act ‘BImSchG’)
  - Biofuels Sustainability Ordinance
- Institutions:
  - Biofuels Quota Act => Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
  - Energy Tax Law => Federal Ministry of Finance
  - Biofuels Strategy => Federal Ministry of Food, Agriculture and Consumer Protection
  - Biofuels Sustainability Ordinance => Federal Office for Agriculture and Food
  - Biofuels F&E and Marketing => Federal Agency for Renewable Ressources

\(^5\) Association of the German Biofuels Industry, www.biokraftstoffverband.de


Associations:

• **BDBE - Federal Association of the German Bioethanol Industry**
• **VDB - Federal Association of the German Biofuels Industry**
• **UFOP - Union for the Promotion of Oil Seeds**
• **BBE - German Bioenergy Association**

### 3.2.4. Feedstock

The cultivation of energy crops on farm land is increasing steadily. After a small decline in 2008, growth areas for RS have grown significantly to 2.28 million ha, accounting for 19% of Germany's total arable farm land in 2011. Thereof, 1.96 million ha were used for energy crops, though the increase of 150,000 ha compared to the previous year was due to an increase in the cultivation of energy crops for biogas production. The production of feedstock for transport fuels, however, decreased slightly.8

Still, with 0.91 million ha, rape seed for biodiesel and pure vegetable oil is the most common energy crop, followed by corn for biogas with 0.8 million ha, and 0.25 million ha of sugar beet and wheat for the production of bioethanol.9 Expressed in metric tons, 0.5 million tons of sugar was derived from sugar beet, and 1.53 million tons of cereals (there of 0.65 million wheat, 0.34 million barley, 0.33 million rye, 0.16 million corn and 0.06 million triticale) were utilized for bioethanol compared with 6.3 million tons of rape seed that was used to produce 87.3% of (soy 2.5%, palm 0.5%, UCO 5.1%, animal fats 2.2%, others 2.4%)10 in 2011.

Considering the agricultural structure in Germany, the available farm land exceeds the area of 0.2 ha per inhabitant that is theoretically needed to ensure sufficient food production in most regions (federal state). Except for the forest-rich regions of Hessen, Saarland, North Rhine-Westphalia, and the cities of Berlin, Hamburg, and Bremen where there are less than 0.2 ha/inhabitant available, the available farm land per inhabitant ranges from 0.21 ha/inhabitant in Rhineland-Palatinate to 0.84 ha/inhabitant in Mecklenburg-Western Pomerania. These calculations, however, neither consider the kind of crops grown, nor any trade activities on the regional, national and global scale, and are, hence, to be seen as a rather theoretical indicator.11

Considering the share of feedstock for biofuels in relation to total feedstock production, developments differ between biodiesel and bioethanol production. Harvests of rape seed declined significantly from 5.7 million tons in 2010 to 3.74 million tons due to smaller total growth areas and weather related losses indicating that more than 50% of the biodiesel’s rape seed demand had to be

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8 Situationsbericht 2011/12 – Trends und Fakten zur Landwirtschaft, www.situationsbericht.de
9 Fachagentur Nachwachsende Rohstoffe, www.fnr.de
11 Statistisches Bundesamt, www.destatis.de
imported in 2011.\textsuperscript{12}

Even though cereal harvests decreased by about 10% to 41.5 million tons, it is obvious that domestic feedstock production is still more than sufficient to fulfill the demand of bioethanol production, which amounts to of 1.5 million tons. The regions of Hesse, North Rhine-Westphalia, Lower Saxony and Schleswig-Holstein provide the largest amounts with an average of >65 decitonne/ha, followed by Baden-Wuerttemberg, Bavaria, Thuringia and Mecklenburg-Western Pomerania with 60 to 65 decitonne/ha, as well as Saxony-Anhalt and Saxony with 55-60 decitonne/ha. Sugar production in Germany increased by 36% to 4.7 million tons compared to 2010 due to enlarged growth areas (plus 14%) for sugar beet, considerable higher yields per hectare (plus 14%), and higher sugar contents of the sugar beet (plus 3%)\textsuperscript{13} cultivated.

On the basis of improved production efficiency, advanced growing and processing technologies, and developments in plant breeding, crops yields could be raised by 1 to 1.5% each year. If this development continues in the future, approximately 150,000 to 200,000 ha farm land could be used without restricting food production. By doing so, the available farm land for energy crop production could be doubled from 2 million ha to approximately 4 million ha without affecting food supply.\textsuperscript{14}

\textsuperscript{12} Union for the Promotion of Oil Seeds UFOP, http://www.ufop.de/4283.php
\textsuperscript{13} Situationsbericht 2011/12: Trends und Fakten zur Landwirtschaft, www.situationsbericht.de
\textsuperscript{14} German Bioenergy Association, www.bioenergie.de

### Useful links:

**Facts and figures:**

- [DBV - German Farmers Association](http://www.dbv.de)
- [DBV - German Farmers Association](http://www.dbv.de)
- [UFOP - Union for the Promotion of Oil Seeds](http://www.ufop.de)
- [VDB - Association of the German Biofuels Industry](http://www.vdb.org)
- [BDBe - Association of the German Bioethanol industry](http://www.bdbe.org)
- [AMI - Agricultural Market Information Company](http://www.ami.de)

#### 3.2.5. Business Case

Investments into ‘business as usual’-technology for transport biofuel production do not receive public funding. Innovative approaches, especially to increase efficiency or reduce GHG-balance of biofuels, may be subsidized via project financing by national budget of FNR for R&D with 25-100% of the costs. The amount of funding depends on the chosen technology, the feedstock utilized, and the innovative character of the project. In some states like Brandenburg, Lower Saxony, and Saxony additional budgets are available for R&D of SME which may be cumulated with national budgets. FNR supports demonstration projects which have finalized the research phase and are likely to continue running on a commercial scale after the demonstration project. Support is given either as an investment grant or an allowance for operating costs.\textsuperscript{15}

\textsuperscript{15} Federal Agency for Renewable Resources, http://
The operation of biofuel facilities is not supported directly, but via reduced energy tax rates for pure biofuels (biodiesel B100 until 2013, bioethanol E85 until 2015) and by quota obligations for mineral oil companies, which increase the demand for biofuels. However, these schemes are not limited to regionally produced biofuels, but they are open to any domestic or imported biofuel which meets the technical and environmental requirements.

The tax rate for B100 and PPO is 18.6 and 18.5 ct/l respectively. From 2013 onwards, the rate will increase to 45.03 ct/l (lower tax rate in relation to diesel fuel with 47.04 ct/l due to lower energy content of biodiesel/PPO). Biofuels used in agriculture and forestry can claim a 100% tax exemption. E85, bioethanol from lingo-cellulosic material, Btl-fuels and biomethane remain tax exempted until 2015.\textsuperscript{16}

In parallel, there is a quota on fossil fuels to blend a total of 6.25% biofuels, out of which a minimum of 4.4% have to be in the diesel sector and a minimum of 2.8% in the petrol sector. Biofuels used to fulfill the quota cannot receive any tax benefit. From 2015 on, a new support scheme, based on GHG-savings, will be introduced as fossil fuels will be obliged to reduce CO\textsubscript{2}-emissions by 3% in 2015, and 7% in 2020 by blending biofuels.\textsuperscript{17}

Since prices for biofuels and their gap to fossil equivalents differ significantly due to volatile feedstock and crude oil prices, we can only provide a snapshot. According to the official biofuels report of the German Parliament of June 2011, costs for biodiesel (without VAT) were approximately 128.93 ct/l, including an energy tax of 18.6 ct/l. Diesel fuel is estimated to be 114.08 ct/l, including an energy tax of 47.04 ct/l.\textsuperscript{18} Costs for PPO were accordingly 119.26 ct/l (including 18.46 ct/l tax). Prices at fuel stations for E85 were at 1.08 ct/l in November 2011 against 1.49 ct/l for petrol fuel, according to C.A.R.M.E.N. e.V.\textsuperscript{19}

**Useful links:**

Project financing and investment subsidies:
- FNR - Federal Agency for Renewable Resources
- BMBF - Federal Ministry for Education and Research
- Federal state of Berlin
- Federal state of Brandenburg
- Federal state of Lower Saxony
- Federal state of Saxony
- General information: [www.energie-foerderung.info](http://www.energie-foerderung.info) and [www.foerderdatenbank.de](http://www.foerderdatenbank.de)

Energy Tax Law:
- Gesetze im Internet
- Biofuels Quota Act (within Federal Immission Control Act ‘BImSchG’)


\textsuperscript{17} Energy Tax Law, [http://www.gesetze-im-internet.de/bimschg/index.html](http://www.gesetze-im-internet.de/bimschg/index.html)

\textsuperscript{18} Biofuels report, Drucksache 17/6928, [http://dipbt.bundestag.de/dip21/btd/17/069/1706928.pdf](http://dipbt.bundestag.de/dip21/btd/17/069/1706928.pdf)

\textsuperscript{19} C.A.R.M.E.N. e.V., [http://www.carmen-ev.de/dt/energie/beispielprojekte/biobrennstoffe/ethanol/preis/index.htm](http://www.carmen-ev.de/dt/energie/beispielprojekte/biobrennstoffe/ethanol/preis/index.htm)
Market Environment

Germany offers excellent geographical and infrastructural framework conditions for investments into biofuel production facilities; although domestic sales markets seem to be saturated at the time being and existing biofuel production plants have huge overcapacities running at low efficiency of approximately 50% (biodiesel). Nevertheless, the substitution of fossil fuels with domestically produced biofuels would be profitable from an economic point of view, as with close to 100 Mtoe approximately 30% of Germany’s primary energy demand is imported in form of mineral oil. This makes the economy vulnerable to supply shortages and price shocks. According to the national biofuel consumption in 2010 and trajectories for reaching 2020’s biofuel target, only 60% are currently achieved, opening the door for additional volumes of biofuels to be placed on German markets.

The agricultural structure is well suited to supply biofuel plants with feedstock and has a long time of experience in doing so. Energy crops, like rape seed, sugar beet or wheat are integrated into crop rotation systems and are also valued for their by-product which is a well sought after animal feed. Transportation systems and storage facilities for feedstocks are available, and road and rail networks are well developed – also in rural areas. In addition, several transnational waterways and oversea-harbors at the Baltic Sea and the North Sea enable imports and exports to eastern European regions.

The market development of biofuels has been exposed to opportunities and threats during the last years. The German tax policy until 2007 incited a strong growth both in biodiesel sales and in investments into biodiesel production facilities, while the market for bioethanol remained a niche market until the introduction of the quota obligations. But with the introduction of increasing tax rates for B100 and PPO, related markets stagnated as even reduced tax rates as applied today did not allow a competitive marketing of pure biofuels in 2010. Ins-

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20 Association of the German Biofuels Industry, www.biokraftstoffverband.de
Instead, the blending market has now become the key sales market for biofuels, but this is limited to ‘technical blending walls’ in frame of related fuel quality standards, which is 7% (B7) for diesel and 10% (E10) for petrol fuel.

**Useful links:**

**Facts and Figures:**

- [Federal Statistical Office](http://www.destatis.de)

**Biodiesel:**

The biodiesel market faced a severe decrease in market shares within the last five years. While the market share of biofuels in 2007 accounted for 7%, it declined to 5.4% in 2011. This decline was due to the drop-out of the markets for B100 and PPO caused by the introduction of a tax on pure biofuels.

Sales of B100 dropped from 1.8 million tons in 2007 to expected 0.06 million tons in 2011 while the sales of fossil diesel fuel increased to 32.1 million tons in 2010. This also increased the sales potential of biodiesel in blends. However, this potential is narrowed by national ‘blending walls’. In Germany, blending of biodiesel is limited to 7% (B7). According to 2010’s diesel fuel consumption of 32.1 million tons, approximately 2.3 million tons of biodiesel could be placed on this market, corresponding to a 7.1% share of the diesel market. As a result, total biodiesel consumption (B100 + B5 resp. B7) decreased in the period from 2007 to 2011 from 3.3 million tons to estimated 2.6 million tons.

The currently tight situation in the biodiesel sector is reflected by the efficiency of German biodiesel producers: only 2.7 million tons of biodiesel were produced in 2011 at a total plant capacity of 4.8 million tons, resulting in an efficiency of only 56%.

Although diesel fuel prices rose by 146% in the period from 1995 to 2011, and diesel demand increased by 47% in the period from 1990 to 2010, B100 cannot compete with fossil diesel fuel prices as long as the energy tax is raised on pure biofuels. In 2007, before the introduction of rising energy taxes on B100, about 1,900 filling stations offered B100 with dedicated fuel pumps. Nowadays, hardly any of them are left.

**Useful links:**

**Associations:**

- [VDB - Federal Association of the German Biofuels Industry](http://vdb-biokraftstoffverband.de)
- [UFOP - Union for the Promotion of Oil Seeds](http://ufop.de)
- [BBE - German Bioenergy Association](http://bbebio.de)
- [MWV - Association of the German Petroleum Industry](http://www.mwv.de)

**Institutions:**

- [FNR - Federal Agency for Renewable Resources](http://www.bmbf.de)
- [German Renewable Energies Agency](http://www.bbf.de)
- [Information Platform](http://www.unendlich-viel-energie.de) and [www.foederal-erneuerbar.de](http://www.foederal-erneuerbar.de)

23 Association of the German Petroleum Industry, [www.mwv.de](http://www.mwv.de)
24 Union for the Promotion of Oil Seeds,
Bioethanol:

In the bioethanol market, the development looks different. Domestic production was steadily heightened from 310,000 tons in 2004 to 576,828 tons in 2011, while total consumption increased from 460,000 tons to 1.2 million tons over the same period. 88% of 2011’s consumption was used for E5 blends, 10.8% for ETBE, and 1.1% were sold as E85. Eight production facilities have a total production capacity of 819,000 tons, which makes an average efficiency of 70%\(^{26}\).

For bioethanol, the ‘blending wall’ is 10% (E10). While a 5% bioethanol blend does not need to be labeled separately at pump stations, E10 is to be clearly marketed as such at the filling stations with pump station dedicated to E10 fuels. The consumption of petrol fuel in 2010 was 19.5 million tons,\(^{27}\) but the demand is steadily declining, resulting in shrinking market volumes for bioethanol blends. According to the mineral oil industry, petrol fuel sales are expected to have decreased by 24.7% in 2020 in relation to 2010, resulting in a market volume of 14.8 million tons.

Sales of E85 still play a marginal role in Germany due to a lack of compatible vehicles and filling stations providing an extra pump for high bioethanol blends. E85 sales increased from 6,000 tons in 2007 to 20,000 tons in 2011.\(^{28}\) The number of filling-stations providing E85 increased steadily to approximately 350, covered all over Germany with a sparse allocation in the north-eastern parts.\(^{29}\)

Useful Links:

Associations:
- **BDBe - Federal Association of the German Bioethanol Industry**
- **BBE - German Bioenergy Association**
- **MWV - Association of the German Petroleum Industry**

Institutions:
- **FNR - Federal Agency for Renewable Resources**
- **C.A.R.M.E.N. e.V.**

General information:
- **E85**

3.2.7. Regulation

Germany has a long track record on implemented support schemes for biofuels in the transport sector and succeeded in introducing and establishing considerable amounts of biodiesel and bioethanol in the market. Until 2007, the key support scheme for biofuels was an exemption from the energy tax (formerly mineral oil tax), which boosted the market for pure biodiesel B100 in particular. In 2007, the support strategy changed to rising quota obligations for the mineral oil industry, and reduced but steadily increasing tax rates for pure biofuels. In addition, since 2011 all biofuels, which are to be accounted to quotas or apply

\(^{26}\) Association of the German Biofuels Industry: Fakten zu Bioethanol, www.biokraftstoffverband.de/downloads/2119/factsheet_bioethanol

\(^{27}\) Association of the German Petroleum Industry, www.mwv.de

\(^{28}\) Association of the German Biofuels Industry

\(^{29}\) E85, www.e85.biz
for lower tax rates, have to proof sustainability according to German biofuels sustainability ordinance (BioKraft-NachV).

To guarantee a steady fuel quality, the technical standards DIN EN 14214 for biodiesel and DIN EN 15376 for bioethanol have to be met. Within valid fuel quality standards for petrol and diesel fuel, low biofuel blends of E10 (to be labeled at fuel pumps) and B7 (without labeling requirement at fuel pumps) are feasible. E85 can be sold separately at filling stations as an own brand.

Energy tax exemption: B100 and PPO were obliged to pay an energy tax of 9 ct/l in 2007, which rose to approximately 18 ct/l in 2012. Despite the fact that this rate is still heavily reduced compared to the tax on fossil diesel (47ct/l), it does not allow a competitive marketing of B100 or PPO on German markets. Only pure biofuels benefit from a reduced energy tax rate; whilst biofuels blended with fossil fuels have to pay the full energy tax rate. Reduced energy tax rates for B100 and PPO can only be applied until end of 2012; from 2013 onwards, they have to be fully taxed. Bioethanol used as E85 remains to be exempted from the energy tax until 2015.30

Quota obligation: Since 2007 the mineral oil industry is obliged to blend biofuels into the fossil fuels they sell. While the fixed quota for diesel fuel remained at 4.4%, the fixed quota for petrol fuel rose from 1.2% in 2007 to 2.8% in 2009. In addition, in 2009 a total quota for fossil fuels, which can be fulfilled by any biofuel, was introduced. This quota amounted to 5.25% and was subsequently increased to 6.25% for the period from 2010 to 2014. Biofuels used to fulfill a quota obligation have to be fully taxed.31

CO₂-mitigation quota: In 2015, a new support mechanism will take effect, introducing a CO₂-mitigation quota for fossil fuels. This quota is to be fulfilled with biofuels, starting with 3% in 2015 and raising to 7% in 2020. Hence, the higher the GHG-mitigation of a biofuel, the less of it is needed to fulfill the quota, and the higher is its market value.32

Useful links:

Laws and Ordinances:
- Energy Tax Law
- Biofuels Quota Act (within Federal Mission Control Act ‘BImSchG’)
- Biofuels Sustainability Ordinance: Gesetze im Internet and www.ble.de

Technical standards:
- Biodiesel DIN EN 14214
- Bioethanol DIN EN 15376
- E85 DIN CEN/TS 15293
- Petrol fuel DIN EN 228
- Diesel fuel DIN EN 590

Institutions:
- Biofuels Quota Act => Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

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and biomass projects, but also in terms of transport biofuel production sites. The market perspectives, political framework conditions and economic parameters are usually well-known to decision makers. A special focus when deciding about credits and loans is put on a reliable, sustainable and long-term feedstock supply, as well as a sound concept for the sales of the product. Due to an already saturated biofuel market in Germany under the current political framework conditions, a low operation efficiency of existing biofuel plants, especially in the biodiesel market, and an increasing import pressure from non-European countries, financing of new biofuel production facilities may become difficult in future times if they do not display a highly innovative character.

In some remote regions, investment subsidies of regional governments may apply for small scale projects with a clear and measurable impact on the rural economy. In addition, the FNR supports R&D-activities for selected biofuel technologies, for increasing the efficiency of biofuels, and for improving the GHG-balances of biofuels.

**Useful links:**

Indices:
- **Standard and Poor’s**
- **Moody’s**
- **Euler Hermes Rating**
- **Corruption Perception Index**
- **IFC World Bank**
In contrast to the market introduction of B100 in the 1990s, the market introduction of E10 was not accompanied by an information campaign, so customers were left alone with a new fuel, so to speak. They became anxious by reports of engine break-downs due to the use of E10. The first attempt to introduce E10 was planned for petrol fuel of the sort ‘super’, which is the regular fuel in Germany. It failed due to public resistance which arose because it forced older cars that are not approved for E10-use, to use the more expensive petrol fuel, called ‘super plus’. Today E10 is provided at an extra fuel pump and is clearly labeled. Even though reservations against E10 persevere, its sales increased due to its comparatively lower price in relation with that of conventional petrol fuel ‘super’.

In addition to technical concerns, customers are concerned about the sustainability and environmental benefits of biofuels due to manifold and aggressive, partly dubious, campaigns of environmental and clerical NGOs. Although the sustainability requirements of RED 2009/28/EC have already been successfully implemented on German markets, the requirements, monitoring rules and control procedures are still unknown to the public.

**Useful links:**

**Associations:**

- BBE - German Bioenergy Association
- BDBe - Federal Association of the German Bioethanol Industry
• UFOP - Union for the Promotion of Oil Seeds
• VDB - Federal Association of the German Biofuels Industry
• OVID - Association of the Oil Seeds Processing Industry in Germany
• BDOel - Association of Decentralized Oil Mills
• FvB - German Biogas Association
• Biogasrat - German Biogas Council
  www.biogasrat.de
• DBV - German Farmers Union

Institutions:
• Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
• Federal Ministry of Food, Agriculture and Consumer Protection
• Federal Office for Agriculture and Food
• Federal Agency for Renewable Resources: www.fnr.de and www.bio-kraftstoffe.info

• German Renewable Energies Agency
  Information Platform: www.unendlich-viel-energie.de and www.foederal-erneuerbar.de
3.3. Italy

Associazione Italiana Energie Agroforestali (AIEL)

Annalisa Paniz
Viale dell’Universita 14
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Tel.: +49-88 30 772
Email: paniz.aiel@cia.it

3.3.1. Country Score

In the general scoring for sector, Italy - Central is rated place 54 out of total 81. The underlying categories that influence this result are displayed in the bar chart.

Country Score Central Italy - Biodiesel (November 2011)

In the general scoring for sector, Italy - Central is rated place 53 out of total 81. The underlying categories that influence this result are displayed in the bar chart.

Country Score Central Italy - Biodiesel (November 2011)
3.3.2. Basic Data

Italy, officially the Italian Republic, is a unitary parliamentary republic in south-central Europe. In the north, Italy borders with France, Switzerland, Austria, and Slovenia along the Alps. Southern Italy is made up of the Italian Peninsula, Sicily, Sardinia—the two largest islands in the Mediterranean Sea—and many other smaller islands. Italy is spread over some 301,338 km² and is characterized by a temperate seasonal climate. With 60.6 million inhabitants, Italy is the fifth most populous country in Europe, and the 23rd most populous country in the world. The population density, which amounts to 201 people per km² (520/sq. mile), is higher than that of most Western European countries. However, the distribution of the population is rather heterogeneous. Whereas areas, such as the metropolitan areas of Rome and Naples, or the Po Valley, which alone accounts for almost half of the national population, are densely populated, vast regions, such as the Alps, the Apennine highlands, the plateaus of Basilicata, and the island of Sardinia are only very sparsely populated.

Italy is divided into 20 regions, five of which are having a special autonomous status that enables them to enact legislation on various local matters. The country is furthermore subdivided into 110 provinces and 8,100 municipalities.

Due to the longitudinal extension of the Italian peninsula, and its largely mountainous internal conformation, Italy’s climate is highly diverse. In the inland of the northern and central regions, climate classifications range from humid subtropical to humid continental, as well as oceanic along the coasts. The climate of the Po valley region is continental and therefore characterized by harsh winters and hot summers. The coastal areas of Liguria, Tuscany and most parts of southern Italy have a Mediterranean climate.

Italy has a relatively small number of global multinational corporations in comparison to other economies of comparable size; however, there is a large number of small and medium-sized enterprises, notoriously clustered in several industrial districts, which constitute the backbone of the Italian industry.

In 2009, Italy was the world’s 7th largest exporter. Italy’s closest trade ties are within the European Union, where 59% of its total trade is conducted. Its largest EU trading partners, in the order of market share, are Germany (12.9%), France (11.4%), and Spain (7.4%).

Nowadays, the Italian economy suffers from numerous problems. After a strong GDP growth of 5–6% per year from the 1950s to the early 1970s, and a progressive slowdown in the 1980s and 1990s, the last decade’s average annual growth rates performed rather poorly at 1.23%, whereas the average annual growth of the EU was at 2.28%. The stagnation of economic growth, and the political efforts to revive it with massive government spending from the 1980s onwards, eventually produced a severe rise in public debt. According Eurostat, Italian pu-
Public debt rose to 116% of GDP in 2010, resulting in the second biggest debt ratio after Greece (with 126.8%).

However, a major difference between Greece and Italy constitutes the fact that the biggest share of Italian public debt is owned by national subjects. Furthermore, Italian living standards are marked by a considerable north-south divide. Whilst the average GDP per capita in the north exceeds the EU average by far, many southern regions lie significantly below this average. Italy has often been referred to as the sick man of Europe, characterised by economic stagnation, political instability, and problems in pursuing reform programs.

More specifically, Italy suffers from structural weaknesses which are due to the geographical conformation, and the lack of raw materials and energy resources: in 2006, the country imported more than 86% of its total energy consumption (99.7% of solid fuels, 92.5% of oil, 91.2% of natural gas, and 15% of electricity). The Italian economy is weakened by its high public deficit as well as its lack of infrastructural development, market reforms, and investment into research. On the Index of Economic Freedom of 2008, the country ranked 64th in the world and 29th in Europe - the lowest rating in the Eurozone.

Italy suffers from an inefficient state bureaucracy, low property rights protection, high levels of corruption, heavy taxation, and public spending that accounts for about half of the national GDP. In addition, the most recent data show that Italy’s spending in R&D in 2006 was equal to 1.14% of GDP which is significantly lower than the EU average of 1.84%.

Regarding the national road network, there were 668,721 km (415,524 mi) of serviceable roads in Italy in 2002, including 6,487 km (4,031 mi) of motorways which are state-owned but privately operated by Atlantia. In 2005, about 34,667,000 passenger cars (590 cars per 1,000 people) and 4,015,000 goods vehicles circulated on the national road network.

In 2003, the national railway network, which is state-owned and operated by Ferrovie dello Stato, extended to 16,287 km (10,120 mi) of which 69% are electrified. 4,937 locomotives and railcars are circulating on this network. In 2002, the national inland waterways network comprised 1,477 km (918 mi) of navigable rivers and channels.

Useful links:

Facts and Figures:
- ISTAT - Italian Statistical Office
- EUROSTAT - European Statistical office
- EUROSTAT - European Statistical office
3.3.3. Energy Policy

Law Decree n.128 issued on the 30th of May 2005 constituted the adoption of the European Directive 2003/30/EC, which set up voluntary national targets for biofuel consumption as a percentage of the total transport fossil fuels. In terms of the energy content, the targets are as follows: 1% by 2005 and 5.75% by 2010. Since these values were lower than those set by the biofuels directive, an infringement procedure was launched against Italy by the European Commission.

In March 2006, Law n.81/2006 introduced mandatory obligations for diesel and gasoline fuel suppliers to achieve a 1% share in terms of the low heating value of biofuels within the total amount of fuels which had been placed on the market in the previous year. This percentage is supposed to be increased by 1% each year until 2010.

Law n.81 of the Financial Law of 2007 set up biofuel obligations at a share of 1% for 2006 and 2% for 2007; however, at the same time this regulatory advancement also introduced a voluntary national target of a 5.75% share, which is to be reached by 2010 and includes both biodiesel and bioethanol.

In April 2008, two new decrees on biofuel obligations (decree n.100 of 23.04.2008 and n.110 of 29.04.2008) were issued, and advanced the clear definition of the regulatory framework regarding bioethanol.

- Decree n.100 established sanctions for
In case they are obtained by feedstocks produced in the EU and processed in an EU plant.

- In case they are released out of the delivering network (‘privately consumed’) as long as the biofuels share is above 25% and the sustainability criteria are fulfilled.

Moreover, according to the decree (and to Art. 21 of the RED), the contribution made by biofuels that are produced from wastes, residues, non-food cellulosic and ligno-cellulosic material can be double counted in the EU 2020 target.

Since January 2012, all biofuels used for transportation have to prove the sustainability of their production according to Decreto Legislativo 3 Marzo 2011, n. 28.
In addition to the import of oil feeds-
tock, significant trade flows of biodiesel
especially between Italy and other EU
countries have been registered. Import
flows are quite diversified, and invol-
ve the USA, the Netherlands, Germany
and France in particular. Export flows
are on the other hand primarily directed
towards France, and, at a much smaller
scale towards Austria and Spain.

It is important to note that the main
target markets for the ethanol produ-
ced and traded in Italy are the food and
beverage industry (28%) and distillates
sector (18%). Industrial usage consti-
tutes yet another important market of
about 28%, of which 10% is represen-
ted by cleansing products. Cosmetic
products make up another 5% of the
market. About 21% of the ethanol mar-
tet is furthermore represented by the
mandatory distillation for ‘public inter-
vention’, which was introduced by Reg.
EC 1623/2000 on the application of the
Common Market Organization for wine
(data referred to 2004).

According to the distilling industry, Ita-
lian ethanol production (excluding etha-
nol used in beverages) reached 92.3
million litres in 2010. However, only a
limited share of the total output is fuel
ethanol, while the rest is used for other
industrial chemicals. Cereals (corn and
wheat), wine and wine-by-products
(wine pomace and dregs) make up the
majority of Italian ethanol production
(see Figure ‘Feedstock’).

In Italy, the maximum share of bioetha-
nol in fuel mixtures is set at 10% of the

3.3.4. Feedstock

In Italy, 4.9% (12,744 km²) of the to-
tal surface area is used for agriculture.
Hence, the majority of biodiesel that is
produced in Italy today depends on im-
ported feedstock mainly consisting of
rapeseed oil. The primary feedstock of
national origin, however, is sunflower oil,
followed by rapeseed and soybean. More-
over, significant trade flows of biodie-
sel, in particular with other EU countries,
have been registered.

Italian biodiesel operators can be divided
into two categories: biodiesel producers
and oilseed crushers. The latter produce
pure vegetal oil for biofuels as well as
the agro-food industry. Some of the oil-
seed crushers also engage in producing
biodiesel. According to industry experts,
cheap biodiesel imports, which some-
times cost less than the raw materials
that they are produced from, have hit
Italian biodiesel producers who mostly
use imported raw materials, such as ra-
peseed, soybean and palm oil, rather
hard over the past couple of years.

Whereas rapeseed oil is imported from
other EU countries, soybean oil is either
produced from imported grain or also
imported from countries within EU. Italy
imports large volumes of rapeseed and
soybean oil, which are processed into
biodiesel and frequently re-exported to
EU member states - sometimes even to
the same countries from which the raw
materials originated.
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The total annual gasoline consumption (E10). However, Italian refineries have not yet started to mix bioethanol with gasoline; however, they are increasingly consuming ETBE (45% ethanol).

3.3.5. Business Case

The Italian biofuel sector does not benefit from any kind of direct subsidies or tax relief quota. In 2011, the government removed all excise exemptions for biodiesel and bioethanol.

Costs of biofuels are highly dependent on the price of feedstock, process cost, land and labour costs, credits for by-products, agricultural subsidies, food prices (sugar), and the oil market. Prices for biofuels and their relative price compared to fossil fuels, however, are not publicly available.

3.3.6. Market Environment

According to Assocostieri (The Italian association of biodiesel producers) the total of Italy’s biodiesel production amounted to 620,000 tons with a turnover of about €1.900 million in 2011. Merely a part of the Italian production was distributed on the national market. Biodiesel is exclusively used in blends with traditional diesel for transport or with diesel for heating. In 2008, there were about 36.1 million registered vehicles, of which 35% were fuelled with diesel.

The production of bioethanol was estimated at 48,722 tons with an annual turnover of €34.5 million (see Table ’Production and Turnover’). At present, only three plants are capable of producing fuel grade ethanol. In 2005, bioethanol for transport represented only 5% of the ethanol market. Despite the existence of biofuel obligations, it was uniquely

<table>
<thead>
<tr>
<th></th>
<th>Production</th>
<th>Production Capacity</th>
<th>Import</th>
<th>Export</th>
<th>Turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel</td>
<td>2,395,240</td>
<td>620,000</td>
<td>1,019,000</td>
<td>158,000</td>
<td>1,900,000,000</td>
</tr>
<tr>
<td>Bioethanol</td>
<td>210,000</td>
<td>48,722</td>
<td></td>
<td></td>
<td>34,476,431</td>
</tr>
</tbody>
</table>

Table ‘Production and Turnover’: Production and relative turnover of biodiesel and bioethanol in 2011

Figure ‘Feedstock’: Shares of the feedstocks used in Italian ethanol production
distributed as an additive (ETBE) not as substitution fuel in gasoline blends.

Italy is aiming at a gradual increase of biofuel consumption. Growth in the transport sector has been relatively stable between 2009 and 2010 (19.2%).

According to the Energy Department of the Economic Development Ministry, Italy used 1,254 ktoe of biodiesel and 140 ktoe of bioethanol – a combined total of 1,394 ktoe – in 2010. While these results fall short of the directive’s stated target, they are higher than the compulsory biofuel share in the fuel mix which was set at 3.5% in 2010 up from 3% in 2009. This obligation was raised to 4% in 2011, and to 4.5% in 2012 respectively. The long term target is to reach 10% by 2020. The relatively low blending levels can be explained by the fact that Italy produces only a small share of the biofuel it consumes itself. Hence biofuel consumption is costly as Italy has to rely on imports in order to meet its European commitments.

The total consumption of fossil and biofuels for transport purposes is summarized in Table ‘Consumption Transport’, and the number of plants, their capacity and regional allocation are depicted in Table ‘Plants’.

The Italian biofuel industry is slowly developing to meet the EU’s 2020 mandatory 10% target with regards to biofuel use in the transportation sector. However, the lack of support from the government, strong competition from South America, as well as complex and vague legislative frameworks on the national and the EU level are severely hampering the industry’s growth. Italy’s biodiesel output is expected to fall some 32% to about 500,000 MT in 2011, whilst the production of bioethanol will remain at a level that is of little relevance.

The bioliquids sector counts over 1,500 employers and guarantees an annual investment of over €500 Million.

According to the industry, Italy exports bioethanol for fuel use to other EU countries. As for ETBE, Italy is a net importer with around 90 million liters of ETBE bioethanol imported in 2010. Italy’s biodiesel imports accounted for about 920

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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Fossil oil</td>
<td>26,170</td>
<td>25,994</td>
<td>26,750</td>
<td>27,045</td>
<td>27,520</td>
<td>27,750</td>
<td>27,765</td>
<td>26,660</td>
<td>26,185</td>
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<tr>
<td>Gasoline</td>
<td>10,415</td>
<td>9,762</td>
<td>9,080</td>
<td>8,680</td>
<td>8,349</td>
<td>8,005</td>
<td>7,840</td>
<td>7,100</td>
<td>6,915</td>
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<tr>
<td>Total</td>
<td>36,585</td>
<td>35,756</td>
<td>35,830</td>
<td>35,725</td>
<td>35,869</td>
<td>35,755</td>
<td>35,605</td>
<td>33,760</td>
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<tr>
<td>Biodiesel</td>
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<td>1,419</td>
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<td>1,315</td>
<td>1,300</td>
<td>1,430</td>
<td>1,635</td>
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<tr>
<td>ETBE</td>
<td>183</td>
<td>217</td>
<td>420</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
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<td>Bioethanol</td>
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<td>0</td>
<td>0</td>
<td>30</td>
<td>100</td>
<td>265</td>
<td>330</td>
<td>790</td>
<td>675</td>
</tr>
<tr>
<td>Total</td>
<td>1,373</td>
<td>1,636</td>
<td>1,640</td>
<td>1,845</td>
<td>1,900</td>
<td>2,195</td>
<td>2,435</td>
<td>3,980</td>
<td>3,740</td>
</tr>
</tbody>
</table>

Source: UP Informa
The Italian company Mossi & Ghisolfi has begun to build the world’s first commercial-scale cellulosic ethanol plant (worth $159 million) in northwestern Italy. The refinery will produce 40,000 to 45,000 MT of ethanol a year from a bamboo-like

Table ‘Plants’: Number of biodiesel and bioethanol plants, their capacity and regional allocation

<table>
<thead>
<tr>
<th>Company name</th>
<th>Place</th>
<th>Capacity (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIODIESEL PLANTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALCHEMIA ITALIA SRL</td>
<td>Rovigo (RO)</td>
<td>15.000</td>
</tr>
<tr>
<td>BIO-VE-OIL OLIMPO SRL</td>
<td>Corato (BA)</td>
<td>100.000</td>
</tr>
<tr>
<td>CEREAL DOCKS SPA</td>
<td>Vicenza (VI)</td>
<td>150.000</td>
</tr>
<tr>
<td>COMLUBE SRL</td>
<td>Castenedolo (BS)</td>
<td>120.000</td>
</tr>
<tr>
<td>DP LUBRIFICANTI SRL</td>
<td>Aprilia (LT)</td>
<td>155.520</td>
</tr>
<tr>
<td>ECOIL</td>
<td>Priolo (SR)</td>
<td>200.000</td>
</tr>
<tr>
<td>F.A.R.</td>
<td>Cologno Monzese (MI)</td>
<td>100.000</td>
</tr>
<tr>
<td>ECO FOX SRL</td>
<td>Vasto (CH)</td>
<td>199.416</td>
</tr>
<tr>
<td>ITAL BI OIL SRL</td>
<td>Monopoli (BA)</td>
<td>190.304</td>
</tr>
<tr>
<td>ITAL GREEN OIL SRL</td>
<td>San Pietro di Morubio (VR)</td>
<td>365.000</td>
</tr>
<tr>
<td>GDR BIOCARBURANTI</td>
<td>Cernusco sul Naviglio (MI)</td>
<td>50.000</td>
</tr>
<tr>
<td>MYTHEN SPA</td>
<td>Ferrandina (MT)</td>
<td>200.000</td>
</tr>
<tr>
<td>NOVAOL SRL</td>
<td>Livorno (LI)</td>
<td>250.000</td>
</tr>
<tr>
<td>NOVAOL SRL</td>
<td>Ravenna (RA)</td>
<td>200.000</td>
</tr>
<tr>
<td>OIL.B SRL</td>
<td>Solbiate Olona (VA)</td>
<td>200.000</td>
</tr>
<tr>
<td>OXEM S.p.A.</td>
<td>Mezzana Bigli (PV)</td>
<td>200.000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>2,395,240</strong></td>
</tr>
<tr>
<td>BIOETHANOL PLANTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAVIRO DISTILLERIE SRL</td>
<td>Faenza (RA)</td>
<td>43.000</td>
</tr>
<tr>
<td>I.M.A SRL</td>
<td>Partinico (PA)</td>
<td>172.000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>215,000</strong></td>
</tr>
</tbody>
</table>

Source: Assocostieri

millions liters in 2010, and several forecasts predict a further increase in 2011. The biodiesel imports surge has partially offset the vegetable oil imports. Rapeseed and palm oil total imports decreased by 59% and 16% respectively over the period from January to August 2011. Italy imports biodiesel mainly from Indonesia, Argentina, Spain, and the Netherlands.

The Italian company Mossi & Ghisolfi has begun to build the world’s first commercial-scale cellulosic ethanol plant (worth $159 million) in northwestern Italy. The refinery will produce 40,000 to 45,000 MT of ethanol a year from a bamboo-like
grass called Arundo Donax. When Arundo Donax will not be available, the plant will employ wheat stalks and rice husks. A biomass electricity plant on the same site will burn waste material to generate about 10 MW of electricity, according to the company. Moreover, Mossi & Ghisolfi and TPG, a U.S. multinational company, have recently signed a $340 million joint venture agreement to run two bioethanol plants in the north of Italy.

3.3.7. Regulation

The Renewal Energy Directive (RED) has been implemented into Italian national legislation on March 3rd with the 28/2011 Decree. The EC Directive 30/2009 has been transposed on March 31st with the 55/2011 Decree. According to the Italian legislative practice, any provision contained in these decrees has to be implemented through another specific decree. All provisions referred to biofuels (energy from RS in transport, sustainability criteria, etc.) will be implemented and become effective on the 1st of January 2012. The decree sets Italy’s obligatory share of biofuels in the car fuel mix at 4.0% for 2011, which will rise to 4.5% by 2012, and to 5.0% by 2014 in order to reach the 10% target by 2020 (see Scheme ‘Obligation Quota’). From the 1st of January 2012, the energy contribution of biofuels will be enhanced in case that they are obtained by feedstock produced in the EU and processed in an EU plant. This is also the case when they are released out of the delivering network (‘privately consumed’) as long as the biofuels share is above 25% and the sustainability criteria are fulfilled.

Moreover, according to the decree (and to Art. 21 of the RED), the contribution made by biofuels produced from wastes, residues, non-food cellulosic, and lignocellulosic material can be double counted in the EU 2020 target.

As for the sustainability criteria, the 55/2011 Decree establishes that economic operators have to comply with a national system of sustainability certification. Therefore, the Italian Ministries of Environment along with the Ministry of Agriculture and Economic Development
are currently designing a decree that sets up the national certification schemes for biofuels. This decree is expected to be finalized and in effect by the end of the year. Besides the imminent National Certification Scheme, the economic operators can apply to a voluntary certification scheme approved by the EU. So far, only three Italian biodiesel plants that belong to the companies Novaol and OXEM have obtained the 2BSvs international certification guaranteeing that all sustainability criteria are fulfilled.

The Italian biofuel sector does not benefit from any kind of direct subsidy or tax relief quota. In 2011, the government removed all the excise exemptions for biodiesel and bioethanol.

### 3.3.8. Project Financing

No dedicated funds for investment supports for state-of-the-art biodiesel and bioethanol facilities are available. However, budgets for financing research and development projects, especially in the field of the utilization of new feedstock basis and the improvement of GHG-balances, amongst other research fields can be developed on regional scales.

Investments in the Italian market are ‘quite safe’ from a country risk perspective. According to COFACE country risk rating,\(^1\) Italy positions itself in the centre span. However, the Corruption Perception Index for the level of transparency is not encouraging.\(^2\)

### 3.3.9. Readiness for Uptake

Public acceptance of biofuels very much depends on prices rather than on environmental concerns. Up to now, the blending of biodiesel with diesel fuel has not been criticized by the public. Nevertheless, environmental NGOs point out rising concerns with regards to palm oil use in the transport sector.

**Useful links:**

**Facts and Figures:**

**Associations**
- Assocostieri (Association of biofuels producing companies)
- Assodistil (Association of Italian distilling companies)

**Facts and Figures:**
- nREAP
- Assocostieri
- Minambiente
- Sviluppoecconomico
- GSE
- ISTAT
- IEA

**Links to databases of companies:**
- Unione Petrolifera

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1 COFACE: http://www.coface.com/CofacePortal/COM_en_EN/pages/home/risks_home/country_risks/country_file/Italy?extraUid=572148
3.4. HUNGARY

Hungarian Bioenergy Competence Centre (HBCC)

Imre Németh
4 Tessedik Road
HU - 2100 Gödöllő
Tel.: +36 28 420 291
Email: obekk@invitel.hu

3.4.1. Country Score

In the general scoring for sector, Hungary - Central Transdanubia is rated place 26 out of total 81. The underlying categories that influence this result are displayed in the bar chart.

In the general scoring for sector, Hungary - Central Transdanubia is rated place 38 out of total 81. The underlying categories that influence this result are displayed in the bar chart.
3.4.2. Basic data

Hungary is a relatively small country with a territory of 93,303 km². It is located in Europe’s continental zone with moderate climate. The annual mean temperature is 11.2 °C, the mean temperature in January is -1.7 °C, and in July it is +22.5 °C. The annual absolute minimum is -16.7 °C, and the absolute maximum is +35.9 °C. 59.5 % of the country’s territory is used for agricultural purposes and 20.5 % is covered by forests. The total cultivation area (agricultural + forest + reed + fish pond) adds up to 81.2 % of the country’s territory. The population is 9,986 thousand. The agricultural territory per person is 5,545 m², and related to cultivated land it is 4,508 m²/person.

In 2010, a total of 3,729,000 vehicles were registered in the country. 80% of these were passenger cars and 11 % were motor lorries. These have used 2.2 million tons of petrol and 3.06 million tons of diesel oil (including industrial usage) in 2010. The average density of population in Hungary is 107 persons/km², while the density of vehicles is 40 pcs/km². The density of the railway network in the country is relatively friendly with 78.8 m/km². The density of national public roads is 4.3 times that of the railway network, which is 389 m/km². The railway network is less utilized, while the public roads are generally overloaded. The transportation of biofuels is realizable either on public roads, on railways, or even on the water (River Danube).

The GDP of the country, except for 2009, has been continuously growing from 2001 by 0.8-4.1% per year. The GDP value was 2,712 million HUF/person in 2010 (9847 €/person). 23.0% of the GDP was produced by the processing industry, 11.3% by trade, 7.56% by the transport sector, and 3.49 % by agriculture in 2010.

The area of the territory suitable for producing biomass (cultivation area) in Hungary is 81.2% of the country’s territory. 59.5% of the area is involved in agricultural production.

Useful links:
- Hungarian Central Statistical Office
- Ministry of National Development

3.4.3. Energy Policy

The reduction of GHG emission related to biofuels is set out by the Governmental Law No. CXVII (abbreviation: Büat) of the year 2010, which is setting out the obligatory mixing quota, the framework conditions of mixing, and it includes guarantee elements concerning sustainability. The government considers research and development related to biofuels to be important and therefore supports this as far as possible. Bio-components added to fossil fuels do not receive any subsidy or tax benefit. The previous excise tax was replaced by the obligation for marketing (with sanctions) in 2009. The bioethanol ratio of E85 fuel had been free of excise tax until the middle of 2011; however, due to the pressure by the common fuel lobby, since that time even this environment-
that only sustainably produced biofuels are allowed to be used as a mixing component to common motor fuels, and it must be certified in an appropriate way. At the moment a GHG saving of 35% can be achieved during the production and use of biofuels, and it could increase to 50% by 2015.

The Tables ‘2020 Target’ and ‘National Overall Target’ provide an overview of the targets that Hungary has to reach.

**Useful links:**
- [Ministry of National Development](#)
- [Hungarian Energy Office](#)
- [Energy Centre Non-profit Ltd.](#)
### 3.4.4. Feedstocks

Among the raw material necessary for the production of first generation biofuels, especially the great volume of corn produced in the country is considerable (see Table ‘Cereal Production’). Corn is produced on 2.7-2.9 million ha, amounting to 12-15 millions of tons harvested each year. 55-56% of this is maize, the rest is corn in the ear. Also the production of oil-seeds in Hungary is consi-
processing capacities for this are going to be completed by the end of the year 2012. In case of better weather conditions the amount of maize produced may even exceed 8-9 million tons, and in such a case even 2.5-3.5 million tons are available for industrial use. Processing maize for bioethanol in larger quantities may reduce the amount of the maize used for forage by several hundred thousand tons through the DGS/DDGS occurring in a greater and greater amount as a by-product. The amount of maize used for forage which is replaced this way may even indirectly increase the raw material base for bioethanol production. Within the next years, Hungary will be capable of completely satisfying the domestic bioethanol demand, and may even export a considerable amount (300-600 thousand tons per year). When it comes to oleaginous plants, summer rape is produced on 300-330 thousand hectares in Hungary. The average produce per hectare is between 2.0 and 2.2 tons/year, which is rather low compared to other European countries. The amount of summer rape produced per year is 530-590 thousand tons on average. For a long time in the past the whole amount of summer rape seeds had been exported. However, two high-capacity biodiesel producing plants have been constructed recently, so that now the full amount of summer rape production can be used for biodiesel production in the country. The biodiesel component which is necessary for integration into conventional fuels, and which is now produced from summer rape grown in Hungary, covers the needs up to 2015-2016. The area for

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<table>
<thead>
<tr>
<th>Table 'National Overall Target'</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
</tbody>
</table>

Source: Hungary’S Renewable Energy Utilisation Actionplan
producing summer rape cannot be expanded in Hungary due to ecological and phytosanitary restrictions. However, the output may be increased with species of higher genetic value, but no more than 650-700 thousand tons/year can be expected in the future. Sunflower is produced on an area (520-580 ha) almost twice as large as that for summer rape, as it can be cultivated in each part of the country. The output per hectare of sunflower is similar to that of summer rape, which is 2.1-2.3 tons per year. The annual amount of produce varies between 970 and 1260 thousand tons per year. 600 thousand tons of these are processed by the Hungarian vegetable oil industry, mainly for food purposes. 40-50% of the sunflower seeds are exported, mainly to the EU. Sunflower seeds and oil are among the most important export goods of the country. Therefore, sunflower may
only be used as a raw material for biodiesel production on a short-term and in a small quantity. With the expansion of the bearing surface and with the involvement of new species (hybrids) with greater output, the amount of sunflower produced may increase on the long-term, allowing for more sunflowers to be used for the biodiesel production. This will become important especially when fulfilling the integration quotas for the years 2018-2020.

Useful links:
- Ministry of Rural Development
- Union of Biomass Product Line
- Hungarian Bioethanol Association
- Hungarian Biomass Competence Center
- Hungarian Biomass Association

3.4.5. Business case

The bioethanol and biodiesel plants, that have been recently built in Hungary have received some small (related to the investment volume) subsidy (national + EU) as outstanding investments; however, they basically have been established from own capital and bank loans. The involvement of foreign capital (Irish and Swedish) in this project was also considerable. A tender called in 2009 with the support of the ‘European Agricultural Fund for Rural Development (EAFRD)’ (In Hungarian: Európai Mezőgazdasági Vidékfejlesztési Alap (EMVA)) for the implementation of small capacity biodiesel and bioethanol plants based on self-produced raw materials turned out to be unsuccessful. EAFRD would have contributed to the investments with a subsidy of €1 million. 28 applications have received the subsidy, but due to economic difficulties and recent dramatic increases in raw material prices, only a few of the planned investments are expected to be actually realized. The benefits of these projects are manifested in the facts that they receive the raw material (bioethanol, vegetable oil) necessary for the production of biofuels from locally produced raw material, using locally produced energy (biogas), integrated into the agricultural plant, utilizing the by-products on site in a closed logistic system, and in a sustainable and environmentally-friendly way. The projects contribute to the diversification of agricultural activities and to the improvement of rural employment. In case of an average maize price of €150 per ton and an oilseed price of €250 per ton, farmers are able to produce raw material for bio-fuel purposes at a competitive price. In Hungary, the bio-components added to fossil fuels have not received any subsidy or tax relief since 2009. Effective rules have set out the integration and marketing of bio-components, and furthermore promote the control of obligatory integration quotas. Failure in fulfilling the regulations is sanctioned by the tax and customs authority. The regulations are addressed at fuel producers, importers, and distributors as well. Between 2008 and 2011, the market turnover of E85 fuel has quickly increased in Hungary. This was due to the fact that the price-difference between petrol with octane
number 95 and E85 was 30%, as no excise tax was charged on the bioethanol content of E85 fuel. The price advantage gained by using E85 could make up for the cost of converting petrol operated cars. In the middle of 2011 the government started to levy an excise tax on E85 fuel in two steps, resulting in a price difference of only 18%. These savings now hardly cover the conversion expenditures and the additional consumption resulting from the lower energy content. Hungary is capable of fulfilling the objectives set out for the year 2020 concerning biofuels from domestic raw materials and domestic production. The expansion of bioethanol production capacities evidently aims at exporting, and the main trading region to this may be the European Union (see Table ‘Production Capacity’).

Useful links:
- Hungarian Development Bank
- www.bitesz.hu
- Hungarian Bioethanol Association
- Hungarian Biomass Competence Center

3.4.6. Market Environment

In Hungary, the vast majority of biofuels is marketed by adding it to common motor fuels. From a market perspective this fuel is related to the motor fuel production and distribution, which has a distribution and service network covering the whole country. Relatively small numbers of fuel distributors rule the market, distributing fuels partially produced in Hungarian oil refineries, and to a lower extend fuels that are imported, which are also subject to the bio-component integration obligation. Except for the approximately 3,000 tons of E85 fuel sold per year, biofuels do not need separate logistics networks. Fuels mixed with bio-components are delivered to the filling stations via railway and public roads. The average annual amount of petrol, containing bio-fuel, used by the traffic sector is 1.5 million tons. Bioethanol in the form of ETBE is mainly mixed to the petrol by direct addition. In 2011, this resulted in the consumption of 72 thousand tons of bioethanol. Multiples of this amount demanded is being produced in

<table>
<thead>
<tr>
<th>Biofuels</th>
<th>Present</th>
<th>Expansion Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel from vegetable oil</td>
<td>200 E ton/year</td>
<td>55 E ton/year</td>
</tr>
<tr>
<td>Bioethanol</td>
<td>200 E ton/year</td>
<td>min. 500 E ton/year max. 100 E ton/year</td>
</tr>
<tr>
<td>During the tender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- biodiesel</td>
<td></td>
<td>33 E ton/year</td>
</tr>
<tr>
<td>- bioethanol</td>
<td></td>
<td>760 E ton/year</td>
</tr>
</tbody>
</table>

Source: Hajdu (2009)
Hungary, but due to trade interests, it is also being imported, whilst the domestic surplus is being exported.

Conventional diesel oil consumption in Hungary amounts to 2.5 million tons per year, to which, according to the obligatory addition regulations, 120 thousand tons of biodiesel were added in 2011. Most of this was produced in Hungarian plants. Taking the EU requirements concerning the year 2020 and Hungarian undertakings into account it can be stated that the country is capable of producing the necessary amount of biofuels to meet the targets from its own raw material in domestic plants. Moreover, a considerable amount, that is 500-600 thousand tons of bioethanol, is being exported.

At the moment, two high-capacity plants are in operation with a total capacity of 420 thousand tons per year, and a third plant is under construction, which is expected to add up to a capacity of 580 thousand tons of ethanol production per year by the end of 2012. According to expectations these plants are going to process 1.6 million tons of maize each year. Further expansion of the bioethanol production capacity in Hungary is possible from the raw material aspect. Efforts are also made to construct ethanol plants with small capacities (5.2 thousand tons per year) integrated into agriculture.

Biodiesel production capacities have been established to produce an amount of 300 thousand tons per year so far. Biodiesel is produced in large capacities in two plants in the country. The raw material demand of these plants exceeds the amount of summer rape produced in Hungary. One of the plants therefore also processes sunflower.

The majority of biofuels produced in Hungary are mixed into fossil fuels. At the moment the mixing ratio is 5% in volume, which is an obligation for fuel distributors. Taking the use of petrol and diesel oil in Hungary into account this reflects 120 thousand tons of bioethanol and 174 thousand tons of biodiesel to be used in 2012. Moreover, bioethanol has been sold in the form of E85 fuel charged by excise tax, in an amount of 3 thousand tons per year. The number of cars using E85 fuel is approximately 50 thousand. E85 fuel is available at about 400 filling stations in the country. B100 biodiesel fuel is not sold in Hungary.

The ‘National Energy Strategy’ proposes an increase of renewable energy use up to 10% in common motor fuels by 2020. In case this will be implemented in the form of biofuels, twice the amount of bio-components, which are already mixed in today, will be necessary, that is 240 thousand tons of bioethanol and 350 thousand tons of biodiesel. Since this amount of bioethanol is already available, it is not going to cause any problems of implementation. Moreover, a considerable amount of bioethanol is already being exported and in the future the amount of biofuel exports may even increase. Meeting the biodiesel demands by 2020 can only be achieved by establishing further capacities and processing a part of the sunflower seeds into
biodiesel. The involvement of the hydrogenated vegetable oil (HVO) plant of the Hungarian fuel producer and distributor HVO will provide some support.

**Useful links:**
- Hungarian Economic Development Centre
- Hungarian Bioethanol Association
- Hungarian Biomass Competence Center
- Hungarian Association of Renewable Energy Sources
- Energy Centre Non-profit Ltd.
- MOL Nyrt

### 3.4.7. Regulations

In Hungary the obligatory integration of bio-fuel components has been set out by order for common motor fuels since 2005, ordered by the law No. XXIX of the year 2004. After that, the integration quota has been gradually increased by occasional rises. Law No. CXXVII of the year 2003 set out the excise tax relief of E85 fuel and biodiesel. The governmental decree No. 138/2009 (VI 30) made new regulations in execution and terminated the tax relief of bio-components added to common motor fuels. The same regulation had set out the new integration norms as well, meaning a volume percentage of 4.8 in 2009. Effectively, this means 3.1% of energy-content for petrol and 4.4% for diesel oil. The law ‘obligatorily’ set out the integration with sanctions concerning each motor fuel marketed. By 2010 the 5.75% volume integration recommended by the Union had previously been admitted by the government, but has only partially been fulfilled by the scheduled date. In 2011 the integration ratio in energy content was 4.6% in average, which will be gradually increased to 10.0% according to the ‘National energy strategy 2020’. The Law No. CXVII of the year 2010 (abbreviation: Büat) set out the moderation of GHGs to be achieved by biofuels, it set out the framework conditions for the integration of bio-components into common motor fuels, and furthermore, it also introduced guarantee elements for sustainability.

In 2011, the government modified the excise tax on fuels by the amendment of certain regulations of the Law No. CXXVII of the year 2003, which had two crucial points. One of them was increasing the diesel oil tax from 97 HUF per litre to 110 HUF per litre. The other one was levying an excise tax of 70 HUF per litre on E85 fuel (see Table ‘Tax-Content’).

The government is gradually effecting the regulation and legal harmonization concerning biofuels produced from waste and residuals set out in paragraph 2 of article 21 of the RED Directive. The regulation mainly aims at the fulfilment of the sustainability criteria, and estimates a saving of 50% of GHG-emissions for the period after 2015. This is also going to affect energy efficiency, especially taking those set out in the FQD into consideration.
Market Handbook Biofuels

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80

Based on past practice of project financing the primary aspect is not the financial standing of the company creating the project but the establishment’s future return, and income producing capability.

Basic conditions of the project and real estate financing
- For the implementation and/or operation of a project of high value usually a partnership is founded.
- It is favourable if the project can physically, financially, and legally be separated from the parent company.
- Incomes and expenses can be separated easily.
- Generally, investments requiring high capital concentration must be implemented involving project management and technical experts of appropriate level.
- Experience gained in the implementation of similar projects is an advantage.
- Involving own funding and coverage promotes the implementation of the credit depending on the nature of the project and the security system.

Basic securities of project and real estate

Table 'Tax-Content': Valid tax-content of motor fuels in Hungary

<table>
<thead>
<tr>
<th>Motor fuel</th>
<th>Excise tax (HUF/l)</th>
<th>VAT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor petrol</td>
<td>120</td>
<td>27</td>
</tr>
<tr>
<td>Diesel oil</td>
<td>110.35</td>
<td>27</td>
</tr>
<tr>
<td>E 85 fuel</td>
<td>70</td>
<td>27</td>
</tr>
<tr>
<td>LPG gas</td>
<td>47.90</td>
<td>27</td>
</tr>
</tbody>
</table>

Note: VAT is charged on the excise tax as well.

Useful links:
- Ministry of National Development
- Hungarian Energy Office
- Energy Centre Non-profit Ltd.
- MOL Zrt

3.4.8. Project Financing

The investments into bio-fuel plants are, amongst others, supported by EU subsidies based on tenders, and with co-financing. Plants producing large capacities of biofuels can receive non-refundable support from the KEOP (Environment and Energy Operative Programme) as outstanding investments, amounting to 10-15%. The majority of these projects had been implemented with the help of foreign capital, affecting their export orientation as well.

The small capacity vegetable oil and alcohol producing plants integrated into agricultural holdings can apply for support from the EAFRD. The maximum support sum is €1 million with a support intensity of maximum 40%. However, besides the 20-30% own funding of the project hosts, trade banks do not finance plants of small capacities. Hence, their construction works are often elongated or fail. Generally, it can be stated that domestic banks, allowing for a few exceptions, keep clear of financing bioenergy projects, in many cases due to the doubt put forward by ecologists. This is one of the major reasons for the slower than desirable development and capacity increases.
te financing
- Transfer of incomes and contractual rights.
- Directing incomes to blocked accounts.
- Mortgage on all instruments and bank accounts of the project.
- Equity of redemption on the real estates.
- Security interests/mortgage on the shares/share in business of the project company.

Moreover, banks have different strategies and solutions in the field of project financing, and for the project companies, company groups with appropriate background, it is essential to find the company admitting and financing the project.

Useful links:
- Hungarian Development Bank
- Hungarian Economic Development Centre

3.4.9. Readiness for Uptake

Several social organizations and clusters in Hungary deal with renewable energy, often on a regional basis. No national coalition has been created in this field, and therefore, no effective campaigns have been organized. In the production and use of bio-energy sources, including biofuels, the processes are defined by the financial and environmental advantages and obligations. The population gladly took the cheaper E85 fuel and even undertook the expenses of converting their vehicles, which will amortize in a relatively short period of time (2-3 years). Producers and distributors of common fuels expanded their production according to market demands, and supplied 400 filling stations with E85. This procedure had been operating well for four years. In 2011 the excise tax had demolished its advantages and the use of this fuel type dramatically dropped back. Therefore, the population gladly receives environment-friendly biofuels. However, fuel producers and distributors in Hungary have reacted in an ambivalent way. One could hardly find PR material providing information on how much biofuels sold in the country contribute to the preservation of our environment, and improving rural employment, besides their national economical advantages.

Useful links:
- Union of Biomass Product Line
- Hungarian Bioethanol Association
- Hungarian Biomass Competence Center
- Hungarian Association of Renewable Energy Sources
3.5. Denmark

Danish Bioenergy Association (DI Bioenergi)
Kristine van het Erve Grunnet
H.C. Andersens Boulevard
DK-1787 Copenhagen V
Tel.: +45 3377 3369
Email: keg@di.de

3.5.1. Country Score

Country Score Central Denmark - Biodiesel (November 2011)

In the general scoring for sector, Denmark - Central is rated place 47 out of total 81. The underlying categories that influence this result are displayed in the bar chart.

Country Score Central Denmark - Biodiesel (November 2011)

In the general scoring for sector, Denmark - Central is rated place 49 out of total 81. The underlying categories that influence this result are displayed in the bar chart.
3.5.2. Basic Data

The Kingdom of Denmark (excluding Greenland and the Faroe Islands) has a mainland area of 43,098 km² and shares a small land border with Germany to the south. Its closest Nordic neighbour is Sweden to which it is connected by bridge. The bulk of Denmark is the peninsula Jutland and the rest of the country consists of 406 islands, of which 78 are inhabited. The largest two islands are Zealand and Funen. Denmark also exercises sovereignty over the Faroe Islands in the North Atlantic and Greenland, which is part of the North American continent, both of which enjoy autonomous self-rule. The topography of Denmark is relatively flat with few hills, its highest point being no more than 173 metres above sea level. Of the total surface area, 62% is used for agriculture, which offers a great theoretical potential for agricultural feedstock supply for the biogas sector.

The population of Denmark was 5.5 million in 2010, with 126 inhabitants per square kilometre, almost half of whom live on the islands of Zealand and Funen. Almost 87% of the population lives in urban settlements. Total primary energy supply (TPES) in 2010 was 19.7 million tons of oil equivalent (Mtoe). Energy production amounted to 23.2 Mtoe, which was below 2009 levels and indicative of falling oil and natural gas production over the past six years.

3.5.3. Energy Policy

The Danish government aims at reaching a share of RES in the final energy consumption of approximately 30%. 50% of the energy consumption in the electricity sector is to come from wind by 2020. The RES-share in Denmark’s final energy consumption shall be rising to 100% in 2050. Due to its characteristics as a storable feedstock and a flexible energy supply, bioenergy will play a key role in this strategy. The RES Directive (VE-direktivet) requires Member States of the EU to meet a binding target of 10% renewable energy share in the country’s transport sector by 2020.

Fuel mixing obligations were introduced with the Act on Sustainable Biofuels (Act No. 468 of 12 June 2009). The act aims to promote the use of sustainable biofuels in land transport. Accordingly, an importer or manufacturer of petrol or diesel has an obligation to ensure that biofuels make up at least 5.75% of the company’s total annual sales of fuel to land transport, measured according to energy content. This target is being phased in over a three-year period: 0.75% in 2010, 3.35% in 2011 and 5.75% in 2012.

The government plans to meet its 10% 2020 target by an increased use of biofuels in the transport sector and by promoting electric vehicles. In the energy agreement of March 2012, it was agreed to amend the law on biofuels in order to ensure incorporation of 10% biofuels in 2020. Implementation, however, awaits an analysis of alternative initiatives to meet the EU commitment in relation to a...
share of renewable energy in the transport sector, which should be finalized in 2015.

The gradual phase-in is necessary because of the development of the infrastructure for storage and distribution of biofuels have shown to take longer than originally estimated. The companies covered by the law, can only fulfill their obligation with biofuels that meet EU sustainability criteria for biofuels.\(^2\)

The biofuel sector is not directly supported but after the targets were implemented, a market for biofuel in Denmark has been enforced. The blend-in targets will insure a future market for biofuels. In addition, biofuels which are blend-in are CO\(_2\)-tax exempted. Biofuels have been exempt from the CO\(_2\) tax imposed on ordinary petrol and diesel for transport since January 2005. This is currently the main supporting measure for biofuels. The Energy Technology Development and Demonstration Programme (ETDDP) has contributed DKK 200 million for the development and demonstration of second-generation biofuels.

\(^2\) Danish Energy Agency

### 3.5.4. Feedstock

Denmark currently produces RME (rape methyl ester) and FAME (fatty acid methyl ester) biodiesel, most of which is exported abroad. The production of FAME biodiesel in Denmark is based on waste from slaughterhouses etc., whereas RME is based on rape seeds. In addition, there is a small production of second-generation bioethanol based on straw – a waste product. The faculty of Agricultural Sciences at Aarhus University has estimated that there is a total potential of less than 2.5 million tons straw annually for energy purposes (heat and ethanol production). These 2.5 million tons of straw are estimated to be able to produce 450-550 million liters of bioethanol. This would correspond to about 15% of Danish fuel consumption.

The Danish Ministry of Food, Agriculture and Fisheries conducted a study on the outlook for Danish biomass production. It found that Danish production of biofuels based on first-generation exploitation of starch and sugar products will hardly be competitive, even if the EU maintains high tariff barriers against imports of bioethanol. Therefore, there are no expectations of a considerably changed crop composition in Danish agriculture as the bulk of the crops will continue to be used in the animal sector.\(^3\)

\(^3\) Energy Policies of IEA countries, Denmark 2011 review
Figure 'Development diesel and FAME': Development of diesel and FAME (biodiesel) in the international listing

Source: Energi - og Olieforum

Figure 'Development Petrol and Ethanol': Development of 95 octan petrol and ethanol in the international listing

Source: Energi - og Olieforum
3.5.5. Business Case

Even though prices for fossil energy carriers in the transportation market rose steadily within the last decade, biofuels cannot compete on the free market as production cost are still higher than the price for fossil fuels.

The price development of the international trading of biofuels is shown in the graphs on the following page. The first graph shows the international listing of biodiesel (FAME) in comparison with the price of conventional diesel. The second graph shows the international listing of bioethanol in comparison with the price of gasoline. (Rates shown are indicative, and estimated by the Danish Oil Industry Association (EOF)).

The international listing of FAME is higher than the listing on environmental diesel, but in the period shown, the listing of FAME follows more or less the listing of environmental diesel. The price difference stays relatively constant, it was on average less than 0.20 €/l (1.5 DKK / l). The difference was at its highest around summer 2008 and summer 2009, when it was over 0.27 €/l (2 DKK / l). In late 2008 the gap was at the lowest of about 0.07 €/l (0.50 DKK / l). During 2009 and forth, the listing of diesel more or less followed the price development of crude oil.4

The international listing of ethanol is higher than the listing of gasoline for the period shown. During the period there have been large fluctuations in the price difference between the two products.

The difference peaked around the start of 2009 when it was close to 0.41 €/l (3 DKK/l), and it was at its lowest in the early summer of 2008 where it was 0.01 €/l (0.10 DKK/liter). Since the summer of 2009 the price difference between ethanol and gasoline increased, to about 0.20 €/l (1.5 DKK/l). During the period, the listing of gasoline more or less followed the trends in the crude oil price.5

In the long term, the transport sector will face a radical conversion from fossil fuels to electricity and biofuels. The energy agreement of the 22nd of March in 2012 contains an overall strategy for the promotion of energy-efficient vehicles. Subsidies totalling €9.41 million (70 million DKK) are to be earmarked for recharging stations for electric cars, sufficient infrastructure is to be built for hydrogen as well as for gas in heavy transport, and fuels must contain 10% biofuels in 2020.

Useful links:
- EOF - Danish Oil Industry Association
- DEA - Danish Energy Agency

3.5.6. Market Environment

Denmark is a net exporter of oil and natural gas and can be expected to remain so at least until end-2018 for oil and 2020 for gas. Energy exports were 17.2 Mtoe in 2010 while imports were 13.8 Mtoe, making Denmark a net exporter of energy. The share of renewable, mainly consisting of wind and biomass, in TPES is relatively high at 20.7%. In

4 Danish Oil Industry Association (EOF)
5 Danish Oil Industry Association (EOF)
2010, oil accounted for over half (54%) of Denmark’s indigenous energy compared to 64% in 2004 when domestic oil production peaked. The share of natural gas in total energy production was 31% in 2010 compared to 34% in 2008. In 2009, the remaining 15% of indigenous energy production came mainly from biomass (12%) and wind power (3%). Denmark generated 38.6 TWh of electricity in 2010, largely from coal (44%), natural gas (20%) and wind power (20%). In 2010, Denmark imported 10.6 TWh of electricity mostly from Norway and Sweden, and exported 11.7 TWh mostly to Germany.

Denmark has one transmission system for gas, owned and operated by Energinet.dk, on behalf of the Danish State. Transmission tariffs are based on an entry-exit model and the same tariffs apply to all entry and exit points. The natural gas transmission system consists of upstream pipelines in the Danish part of the North Sea and onshore transmission pipelines. The transmission pipelines go north-south (Aalborg-Ellund) and west-east (Nybro-Dragør). The natural gas transmission system also includes a gas treatment plant (Nybro) and two underground gas storage facilities (Stenlille and Lille Torup). The Danish gas transmission grid is connected to the German gas transmission grid at Ellund on the Danish/German border and to the Swedish gas system at Dragør. Sweden is solely supplied with gas via the Danish gas system.

The electricity transmission system in Denmark is separated both operationally and geographically into two parts, the west (Jutland and Funen) and the east (Zealand). In 2005, Energinet.dk was established, as a single state-owned transmission system operator, by merging two system operators: Elkraft in western Denmark and Eltra in eastern Denmark. Geographical separation ended in 2010 when the Great Belt Power Link connecting western and eastern areas with 400 kV direct current cables was commissioned. Despite separation within Denmark, the eastern area was already connected with Sweden and the western area was connected with Norway and Sweden. Therefore, both areas had been able to trade electricity through the Nordic market even without the Great Belt Power Link. The 6,300 km-long Danish transmission system consists of 400 kV and 150/132 kV lines. Energinet.dk is the owner of the 400 kV facilities, as well as part of the 132 kV facilities, the Great Belt Power Link and interconnection lines with Norway, Sweden and Germany. Most of the 150/132 kV transmission facilities are owned by nine regional grid companies.

Energy consumption for transport was 209.1 PJ in 2010 of which bioethanol and biodiesel amounted to 1.1 PJ (see Figure ‘Energy Consumption Transport’) for the development of the production of biofuel. Out of the total energy consumption in the transport sector in 2010, passenger transport accounted for 139.9 PJ, corresponding to 66.9% Energy consumption for freight transport was 67.7 PJ, corresponding to 32.4%, and energy consumption for transport by the Danish
Defence was 1.5 PJ.\(^6\)

In 2010, power generation from biofuels totalled 3,068 GWh. It has remained relatively stable from one year to the next, but biofuel-based power generating capacity has been increasing in Denmark in recent years. The most recent addition is a separate straw-fired unit commissioned at Fyn Power Station in 2009.\(^7\)

Denmark considers the use of biomass for CHP production to be more cost-effective compared to the production of biofuels (first-generation), and therefore does not push first-generation biofuels intensely. Attention is paid to developing second-generation bioethanol. Funds are foreseen for research in this field and for a demonstration plant.\(^8\)

### 3.5.7. Regulation

Fuel mixing obligations were introduced with the Act on Sustainable Biofuels (Act No. 468 of 12 June 2009). The act aims to promote the use of sustainable biofuels in land transport so that Denmark can meet its international climate commitments.

Accordingly, an importer or manufacturer of petrol or diesel has an obligation to ensure that biofuels make up at least 5.75% of the company’s total annual sale of fuel to land transport, measured according to energy content. This target is being phased in over a three-year period: 0.75% in 2010, 3.35% in 2011 and

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6 Energy Statistic 2010
7 Energy Policies of IEA countries, Denmark 2011 review
5.75% in 2012.9

The Danish Energy Agency has developed a handbook to clarify the rules for documentation of compliance which are defined under the Act for Sustainable Biofuels and the requirements for reducing greenhouse gases and regulations established under this Act. The handbook is part of the regulatory basis for the Danish Energy Agency’s regulation of the area and contains a description of the applicable regulations.

The handbook describes in details:

- Requirements for sustainability, including land criteria and greenhouse gas displacement and evidence of this
- Double Counting of specific biofuels
- The mass balance principle
- Checking the information on the sustainability of biofuels in the annual report to the DEA
- Voluntary arrangements (voluntary schemes) and subsequent control

### 3.5.8. Project Financing

Investments in Danish markets are considered to be ‘safe’ from a country risk perspective, according to established rating agencies. Reliability and credit worthiness of the Danish economy is rated with best scores at Standard & Poor’s10 and Moody’s. COFACE country risk rating sees Denmark at the top of the score11

9 Energy Policies of IEA countries, Denmark 2011 review
11 COFACE, http://www.coface.com/CofacePor-
3.5.9. Readiness for Uptake

Key institutions:

The Danish Ministry of Climate, Energy and Building (previously known as the Ministry of Climate and Energy), established in November 2007, was created as a part of the government’s increased efforts to promote a greener and more sustainable society. The ministry is responsible for national and international efforts to mitigate climate change, as well as for energy, national geological surveys in Denmark and Greenland, and for meteorology.

The Danish Energy Agency (DEA) was established in 1976, and is an agency under the Ministry of Climate, Energy and Building. It is responsible for all tasks related to the production, transmission and utilisation of energy, and its impact on climate change. Its principal function is to ensure the legal and political framework for reliable, affordable and clean supply of energy in Denmark.

Energinet.dk, the transmission system operator, is an independent public enterprise owned by the Danish State represented by the Ministry of Climate, Energy and Building. It owns the natural gas transmission system and the 400 kV electricity transmission systems and is the co-owner of the electricity interconnections to Norway, Sweden and Germany. It is responsible for maintaining security of supply and ensuring the smooth operation of the market for electricity and gas. Energinet.dk was established in 2005 following a merger between Eltra, Elkraft System, Elkraft Transmission and Gastra.

The Danish Energy Saving Trust is an independent body established in 2010 as a trust under the auspices of the Ministry of Climate, Energy and Building, replacing the Danish Electricity Saving Trust. The scope of the previous organisation’s work has been expanded from electricity savings to cover savings and more efficient use of all forms of energy in every sector other than transport.

The Danish Energy Regulatory Authority (DERA) oversees the electricity, natural gas and district heating markets. DERA is an independent authority and its board members are appointed by the Minister of Climate and Energy. Its decisions can be appealed to the Danish Energy Board of Appeal.

The independent Danish Commission on Climate Change Policy was established by government in 2007 and was charged with the task of identifying the long-term climate and energy policies needed to achieve independence from fossil fuels. The Climate Commission’s proceedings were attended by the Ministry of Climate, Energy and Building, the Ministry of Economic and Business Affairs, the Ministry of the Environment and the Ministry of Finance. The Commission published its findings in September 2010 and ceased activities in November 2011.

16 Energy Policies of IEA countries, Denmark 2011 review
### 3.6. Sweden

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#### 3.6.1. Country Score

**Country Score Sweden Middle Norrland - Biodiesel (November 2011)**

In the general scoring for sector, Sweden - Middle Norrland is rated place 42 out of total 81. The underlying categories that influence this result are displayed in the bar chart.

**Country Score Sweden Middle Norrland - Bioethanol (November 2011)**

In the general scoring for sector, Sweden - Middle Norrland is rated place 42 out of total 81. The underlying categories that influence this result are displayed in the bar chart.
3.6.2. Basic Data

Sweden is a one of the most northern states of the EU. Since its lands are stretched over the Arctic Circle the agricultural gradient of the country is a steep one. Bioenergy is the country’s largest energy source and around 140 TWh thereof are used annually. Bioenergy surpassed oil as the major energy source in 2009, and bioenergy usage is bigger than that of hydro and nuclear power combined. The majority is used by the industry, followed by domestic small-scale heating and district heating systems. Sweden has managed to increase its use of bioenergy by 100 TWh (almost 10 Mtoe, million tons of oil equivalent) during the last 40 years. The transition has accelerated over time, and during the last decade the growth of the sector has been 3 – 4 TWh per year. Over the year 2012, Sweden will achieve to have 10% renewable energy in the transport sector.

Sweden consists of eight NUTS2 regions. With a surface of 450,295 km², Sweden...
is the third largest country in the EU; however, with a total population of about 9.4 million it is only the fourteen most populated one. On average, 21 inhabitants live per square kilometre whereas the population is mostly concentrated in the southern half of the country. About 85% of the population lives in urban areas. Sweden’s capital city is Stockholm, which is also the largest city. The country is characterised by its long and narrow shape with the main part of the population spread over the middle and southern parts of the country. Hence, agricultural practices and available feedstock differ amongst regions. Also energy needs, energy dependence, and/or limitations of the transportation of goods and people differ significantly amongst the regions.

Due to the fact that merely 6,5% of the total surface area is used for agriculture, Sweden’s agricultural feedstock supply for the biogas sector is relatively small in relation to its total size. The total surface area covered by forest is 63% (or 48% productive forest lands) making forest based fuels the biggest biomass source for bioenergy. However, there is still a large unused potential of available feedstock for the increased production of biogas from sources such as agriculture, forestry, households, restaurants, and the industrial processing industry.

In 2011, about 4,4 million registered personal vehicles, 549,214 trucks, and 13,964 busses were fuelled with 4,2 million m³ million tons of gasoline fuel, 5,3 million m³ of diesel fuel, and 0,2 million m³ of E85, indicating a large market of potential biofuel customers.

The road- and rail network is quite dense and in good condition; therefore, transportation of both feedstock and produced biofuels is feasible all around the year.

Useful links:

Facts and Figures:

- EUROSTAT
- Swedish Energy Agency
- Swedish Board of Agriculture
- Swedish Forest Agency
- Official Swedish Statistics
- Swedish Transport Agency, Transportsstyrelsen

3.6.3. Energy policy

The Swedish government aims at reaching a share of RES in the final energy consumption of 50% by 2020. Since in 2011 the share of renewable energy already amounted to 48,9%, the target set for 2020 cannot be seen as ambitious. The same holds true for the 2020 target with regards to the transport sector which has to include a 10% share of RES. According to the estimations of the Swedish energy agency, these targets will already be reached during 2012. As Sweden has already met the 2020 target, the political will to introduce new, costly support schemes is rather low. Nevertheless, additional policies and incentive structure need to be put in place in order for Sweden to reach its long-term ambitions: in 2050 Sweden shall
have no net CO₂ emissions and in 2030, the vehicle fleet shall be independent of fossil energy. The government has started to discuss how to meet these targets but there will be no clear policy in place before 2014.

Under the current policy all sustainable biofuels that abide to the Swedish legislation implemented in accordance with the RED1 of 2010 are exempted from the energy and carbon tax. Fuel taxes for vehicle fuels are high in Sweden: gasoline has a total tax of 5.65 SEK/litre (energy tax 3.14 SEK/litre and Carbon tax 2.51 SEK/litre) plus a VAT of 25%; diesel MK1 standard has a total tax of 4.67 SEK/litre (energy tax 1.57 SEK/litre and Carbon tax 3.1 SEK/litre) plus 25% VAT. It should be noted that the fuel standard of diesel differs from other parts of Europe due to higher environmental demands compared to rest of Europe. Hence, diesel fulfilling only the European standard EN 590 is taxed higher (total tax 5.08 SEK/litre) as it is put in a lower environmental class relative to Swedish MK1 Diesel, SS 15 54 35. The main diesel market is therefore MK1 as the higher taxes make it difficult for European diesel to compete on the market. Moreover, some agencies and companies have additional restrictions in place that do not allow their vehicles to tank non-MK1 grade diesel. Since in the long run energy taxes are supposed to be harmonized according to the energy content of the fuel, it is stated that the energy tax of diesel shall be raced. Biofuels such as ethanol, biodiesel, HVO and biogas are only taxed at 25% VAT, which makes them competitive on the market in spite of their higher production costs.

One of the key factors for the successful introduction of biofuels have been the simultaneous stimuli of logistics and infrastructure for biofuels, with tax reliefs for flexifuel cars and the enforcement of the so-called pump law,² forcing all filling stations that sell more than 2,500 m³ annually to provide alternative biofuel for its customers.

**Useful links:**

**Laws and Ordinances:**
- Energy Tax Law

**Institutions:**
- Swedish Transport Agency, Transportsstyrelsen
- Swedish Energy Agency
- Swedish Board of Agriculture

**Associations:**
- BAFF - BioAlcohol Fuel Foundation
- Gröna Bilister
- Miljöfordon
- Svebio - Swedish bioenergy association
- Swedish Farmers Union

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2 Pumplagen http://www.notisum.se/rnp/SLS/fakta/a0051248.htm
3.6.4. Feedstock

The agricultural sector in Sweden is small and shrinking due to its inability to compete with imports. As in many other countries, biofuel production in Sweden has been initiated by farmers in order to enlarge the market for agricultural crops. In general the overall use of agricultural crops for energy production is low in Sweden.

The major feedstock for biodiesel production is rape seed as the oil extracted from this crop is resilient to the cold temperatures in Sweden. Nowadays, Sweden also imports rape seed and/or rape seed oils. For ethanol production, wheat but also small quantities of barley constitute the major feedstock. Also wheat is being imported to be utilized as feedstock. There are also plans to start production based on organic sugar-rich waste. In Sweden forest based ethanol and biodiesel are expected to lead future market development. Hence, increased biofuel production in Sweden is not expected to lead to increased agricultural activity. However, the areas of set-aside agricultural lands are relatively large (172 552 ha).

Useful links:
- Facts and figures:
- LRF - Swedish Farmer association
- Swedish Energy Agency
- Swedish Board of Agriculture
- Official Swedish Statistics

3.6.5. Business Case

Investments into ‘business as usual’-technology for transport biofuel production are not supported with public budgets. Innovative approaches, though, especially those to increase efficiency or to reduce GHG-balances of biofuels may be subsidized via project financing by the Swedish energy agency by up to 30 % of the investment cost. However, these funds are hard to obtain and, generally, funding is only available for pilot plants.

The operation of biofuel facilities is not supported directly, but the production is supported by the exemption of biofuels from the energy, and carbon tax. However, this exemption applies for all sustainable biofuels indifferent of their country of origin. Hence, no direct support targets to promote domestic production.

The largest barrier in Sweden constitutes the unclear policy structure, where there are no policies in place after 31st of December 2013. This applies for both fuels and vehicles. The unclear policy situation, combined with the fact that Sweden has already reached its 2020 target, as well as the not yet fully defined long term goal for the transportation sector of being independent of fossil fuels in 2030, makes the Swedish market growth rate hard to predict.

However, Sweden has still not yet fully implemented the changed limits for low blend of ethanol and biodiesel into gasoline and diesel. With the current blending rates of 5% in gasoline and 5% in diesel, the low blend market will increase rapidly within the coming years. Cu-
3.6.6. Market Environment

The focus on the development of domestic biofuel production is centred on forest or cellulose-based production methods. At the same time, the agricultural sector is relatively slow in Sweden so that the investment climate for new large-scale production units based on traditional feedstock is low.

There are, however, plans to build additional biodiesel and ethanol plants due to the high technical standards of the products. These plants will be dependent on feedstock imports as well as new feedstock, such as Mixed Fatty acids, organic waste, and oils. However, as ethanol and biodiesel are globally traded commodities, and as Sweden has no subsidies targeted at national producing plants, production facilities will have to be competitive with global biofuel prices. However, ethanol for low blends is, to a certain extent, protected by the EU-wide duty for these volumes. Hence, ethanol producers only have to compete with EU produced biofuels.

Many local municipalities and regional county administrative boards also set their own climate targets for the transport sector leading to variations in the business environment in different parts of the country.

Useful links:

Project financing and investment subsidies:
- **Swedish Energy Agency**
- **Energy Tax Law**

Market reports:
- **Official annual energy report, targeted towards journalist and the general public Energiläget**

Currently suggested policies would require oil companies to increase the low blend up to 10% ethanol and 7% biodiesel by 2014. However, no official decision has been made so far, and the suggestion has been rejected by the market actors. Considering the high blend, Sweden is characterised by its unique level of high public acceptance of biofuel, the large amount of flexifuel vehicles including trucks and busses that are already driving on biofuels, and the already established fuel logistics of 1700 E85 pumps and 50 B100 pumps (a number that will increase with six pumps during 2012 alone).

Available products are well known in the market, which is ready for uptake since also permit and funding agencies, as well as banks are willing to allow development. Company establishment is furthermore aided by an increasing number of small-scale fossil regional oil companies increasing the number of purchasers.

Useful links:

Facts and Figures:
- **Swedish Energy Agency**
As the introduction of B100 is mostly driven on a political and customer-based level, the general ambition of CO₂ reduction of Swedish biodiesel producers are higher than in other countries, especially with regards to the volumes intended for the B100 market. Therefore, already today a climate reduction of over 50% can be guaranteed.

**Useful links:**

**Associations:**
- **Svebio - Swedish Bioenergy Association**
- **SPBI - The Swedish Petroleum and Biofuel Institute**
- **LRF - Swedish Farmer association**

**Institutions:**
- **Swedish Agency for transportation**
- **Swedish Energy Agency**
- **Lantmännen Agroetanol**
- **Perstorp Bioproducts**
- **SEKAB**

**Biodiesel:**

The biodiesel market has increased over the last few years and is expected to continue to grow, provided that the current policy with regards to the B100 fuel is not modified. The low blend of biodiesel will most probably increase from the current 5 to 7%. The interest amongst freight traffic is high and the number of additional fuelling pumps for B100 is steadily increasing as the market is asking for low carbon transport. Periodically, it is even financially advantageous to run trucks and busses on B100 in Sweden.

The sales of FAME during 2011 was 250,000 m³, out of which 224,000 m³ were sold as low blend and 26,000 m³ were sold as B100. The sales of FAME has increased from a total of 11 m³ in 2005 to today’s volumes.³ The sales of low blend FAME have increased due to the strong trend of growing diesel use in Sweden which has augmented by 40% since 2002.

Due to the weather conditions in Sweden, all biodiesel volumes sold must follow the biodiesel specification SS-EN 14214. It is furthermore recommended to avoid the use of B100 when temperatures fall below -20°C for extended periods.

³ Transportsektorns energianvändning 2011, ES 2012:01

**Bioethanol:**

In the bioethanol market, the development looks different. Its rapid expansion has slowed down due to reduced sales of gasoline in Sweden, as well as the increased scepticisms against the E85 fuel. Relatively low fossil fuel prices, combined with the arising questions of the sustainability of the fuel are furthermore spoiling the growth of the market. ED95 is suitable to fuel larger buses and lorries, but it has not yet gained a large market for freight traffic and until now, there is only one public filling station.

During the last year, however, E85 has again become more popular as the glo-
General information:
- **BAFF - BioAlcohol Fuel Foundation**
- **Gröna Bilister**
- **Miljöfordon**

### 3.6.7. Regulation

In order to guarantee a steady fuel quality, the technical standard SS-EN 14214 for biodiesel, B100 and SS 155480 for bioethanol and E85 have to be met. Within valid fuel quality standards for petrol and diesel fuel, low biofuel blends of E5 and B5 are feasible. E85 and ED95 can be sold separately at filling stations as own brands. All biofuels must follow the Swedish sustainability criteria⁴ in order to be sold as biofuels.

Sweden has had successful incentives in place to build a strong biofuel market of both light and heavy vehicles. The combination of high fossil fuel taxes (energy and carbon tax) according to the polluter pays principle, and tax exemptions for biofuels have provided the latter with steady market growth. To support these incentives, other policies such as the pumplagen,⁵ a bill that requires all filling stations with an annual sold volume above 1000 m³ to provide its customers with a renewable option, have been put in place. This law has been questioned, as most pumps offered bioethanol at the time when the law was enforced since it constituted the major biofuel and also a cheaper biofuel instalment relative to biodiesel prices have risen. Currently, there are only two bioethanol production facilities in Sweden. One of them is producing around half of the bioethanol used for low blending, whilst the other one is a remnant forest based ethanol production unit that was initiated in the 1940s. The latter is still selling a large part of its volumes as exports due to its uniqueness and climatic profile. Hence, Sweden is heavily dependent on ethanol imports.

Sales of E85 still play a significant role in the Swedish transport sector. With over 1700 filling stations all over Sweden, it is the one biofuel that is accessible to all light vehicles. In comparison, there are around 2,800 gasoline filling stations. Considering the fact that there are around 230,000 flexifuel vehicles with engines dedicated to E85, the growth potential of the market is significant since many of these cars periodically drive on gasoline.

**Useful Links:**

**Associations:**
- Svebio - Swedish Bioenergy Association
- SPBI - The Swedish Petroleum and biofuel institute
- BAFF - BioAlcohol Fuel Foundation
- Gröna Bilister

**Institutions:**
- Swedish Transport Agency, Transportstyrelsen
- Swedish Energy Agency
- Swedish Board of Agriculture

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⁴ Lag (2010:598) om hållbarhetskriterier för biodrivmedel och flytande
⁵ Pumplagen http://www.notisum.se/rnp/sls/fakta/a0051248.htm
vehicle gas. The law has, however, resulted in the presence of renewable energy option for car owners in all regions of Sweden. Therefore, entire Sweden is a market for cars dedicated to renewable fuels.

In order to facilitate the introduction of biofuel vehicles that follow the state definition of an environmental car, they are exempted from vehicle taxes for a period of five years. In addition, drivers that had already driven E85 company cars received a reduction of their fringe benefits by 20%. This tax reduction was, however, omitted in 2011. Another tool to boost the introduction of environmental cars used to be the free parking in city areas, and their exemption from congestion charges in Stockholm.

Useful links:
Laws and Ordinances:
- Energy Tax Law
- Swedish Sustainability criteria for liquid biofuels:
  - Lag (2010:598) om hållbarhetskriterier för biodrivmedel och flytande ...
  - Law for renewable filling stations, Pumplagen
  - Law for vehicle fuels, Lagen om motorbränslen

Technical standards:
- Biodiesel, B100 SS-EN 14214
- Bioethanol, E85 SS 155480
- Petrol fuel SS 15 54 22

- Diesel fuel SS 15 54 35

Institutions:
- Swedish Transport Agency, Transportsstyrelsen
- Swedish Energy Agency
- Swedish Board of Agriculture

Associations:
- Svebio - Swedish Bioenergy Association
- SPBI - The Swedish Petroleum and Biofuel Institute
- BAFF - BioAlcohol Fuel Foundation
- Gröna Bilister

3.6.8. Project Financing

According to established rating agencies, investments into Swedish markets are ‘safe’ from a country risk perspective. Reliability and credit worthiness of the Swedish economy is rated with best scores at Standard & Poor’s and Moody’s. Also COFACE country risk rating sees Sweden at the top of the score. The same holds true for the Corruption Perception Index measuring the level of transparency. Whilst the ease of doing business in Sweden is regarded as quite well in Sweden by IFC World Bank, starting a business is ranked relatively low due to high administration and regu-

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6 http://www.notisum.se/rnp/sls/lag/20060227.htm

3.6.9. Readiness for Uptake

Bioenergy is Sweden’s largest, and therefore well established energy source. However, politicians and the general public often underestimate the importance of bioenergy when being asked. Nowadays, biofuels, such as bioethanol and biodiesel are known as products and they are accepted as commercial technologies and available infrastructure. The low blending of ethanol and biodiesel in gasoline and diesel are not as well known, and a risk of market reluctance towards an increased level of low blend exists. As this has not been tested in Sweden, a large focus will be placed on information when the low blend is increased in the near future.

Even though bioethanol and biodiesel are well known and standardized products, which can be found all over Sweden, relatively large prejudices regarding engine problems that might occur when using these fuels remain persistent. Many flexifuel car owners are even instructed to regularly fuel their cars with gasoline by car companies. There is also a notion that bioethanol is less energy effective compared to diesel, and owners complain that they have to fuel their cars too often. All these are all obstacles that can be overcome with information and marketing. Also the sustainability of biofuels, such as bioethanol and biodiesel has been questioned in recent years. This situation has been aggravated as new suppliers of bioethanol have entered the market, which have been procuring bioethanol from Brazil. The enforcement

...
of the new law of Swedish Sustainability criteria for liquid biofuels that forces all biofuels that receive governmental support to verify its origin and sustainability has improved the situation to a certain extent.

The introduction of biofuels, such as bioethanol and biodiesel has clearly shown that the biggest driver for the shift towards renewable fuels has been the financial gain of individual consumers. Sales numbers of biofuel and flexifuel vehicles have risen and fallen in relation to the competing fossil fuel prices. Many consumers are worried regarding the second hand value of their cars since the incentive situation is so unclear at the moment. Many customers feel that it is safer to by a fossil fuel car rather than a flexifuel car, as they are not certain that there will be a market for the latter over the next few years.

**Useful links:**

**Associations:**
- [Svebio - Swedish Bioenergy Association](#)
- [SPBI -The Swedish Petroleum and Biofuel Institute](#)
- [BAFF - BioAlcohol Fuel Foundation](#)
- [Gröna Bilister](#)
- [LRF - Swedish Farmer association](#)

**Institutions:**
- [Swedish Energy Agency](#)
- [Swedish Board of Agriculture](#)
- [The Swedish board of Transportation](#)
3.7. Latvia

Latvian Biomass Association (LATbio)
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Jaunbumani, Dreilīni
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3.7.1. Country Score

Country Score Latvia - Biodiesel (November 2011)

In the general scoring for sector, Latvia is rated place 81 out of total 81. The underlying categories that influence this result are displayed in the bar chart.

Country Score Latvia - Bioethanol (November 2011)

In the general scoring for sector, Latvia is rated place 81 out of total 81. The underlying categories that influence this result are displayed in the bar chart.
3.7.2. Basic Data

Latvia, officially the Republic of Latvia, is a country in the Baltic region of Northern Europe. It is bordered to the north by Estonia, to the south by Lithuania, to the east by the Russian Federation, to the southeast by Belarus and has a maritime border with Sweden to the west. Latvia is a unitary parliamentary republic and it is divided into 118 administrative divisions of which 109 are municipalities and 9 are cities. The capital of Latvia is Riga; about one third of the country’s population lives there. The official language is Latvian and the currency is called Lats (Ls).

Latvia has a humid semi-continental climate characterized by warm summers, freezing winters and frequently high levels of humidity and precipitation. Latvia’s weather conditions are influenced by the proximity of the Baltic Sea.

Latvia has four pronounced seasons of near-equal length. Winters, starting in mid-December and lasting till mid-March, have average temperatures of around – 6°C and they are characterized by stable snow cover, bright sunshine, and short days. Severe spells of winter weather with cold winds, extreme temperatures of around – 30°C and heavy snowfalls are common. Summers, starting in June and lasting till August, are usually warm and sunny with cool evenings and nights. Summers have average temperatures of around +19°C with extremes of +35°C. The weather in spring and autumn is fairly mild.

Latvia has hundreds of kilometres of seashore lined with pine forests, dunes, and continuous white sand beaches. There are three major ports in Latvia – Liepaja, Riga and Ventspils, as well as seven smaller ports – Skulte, Mersrags, Salacgriva, Pavilosta, Roja, Lielupe, and Engure, which are situated along the entire coastline of Latvia.¹

There are five planning regions of Latvia: Kurzeme, Latgale, Riga, Vidzeme, and Zemgale regions. The planning regions of Latvia are not administrative territorial divisions, since they are not mentioned in the law which lays down the administrative territorial divisions of Latvia. With 2,229,641 inhabitants and a territory of 64,559 km² it is one of the least populated countries of the European Union. There are five cities with more than 50,000 inhabitants.

3.7.3. Energy Policy

According to Directive 2009/28/EC of the European Parliament and the Council from the 23rd of April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC on renewable energy Latvia has one of the highest individual targets for the share of renewable energy by 2020, namely 40% from total gross final energy consumption. The share of renewable energy in the transport sector must reach at least 10% by 2020 (2009 – 1.1%, 2010 – 3.3%) of gross final energy consumption for transport.²

¹ Latvia in brief. Latvian Institute. http://www.latvia.eu/content/latvia-brief
² Ministry of Economics of Republic of Latvia.
Latvia’s RES targets by 2020 and beyond are the following:

1) By 2020, the share of renewable energy in total gross final energy consumption has to be increased to at least 40%. Thereafter it has to be increased gradually (in 2005 it was 32.6%);

2) By 2020, the share of renewable energy in the transport sector must reach at least 10% of gross final energy consumption for transport and it has to be increased gradually thereafter.

The Law on Renewable Energy still has not been passed by the Saeima. The draft Law on Renewable Energy specifies measures and targets for renewable energy generation and the total final energy consumption that must be achieved by 2020. Furthermore, it provides financial instruments that promote the use of renewable energy.

The main measures in nREAP:

- Financial support quotas for types of biofuel (Cabinet Regulation No 280 of 15.04.2008);
- Reduction of excise duty (the Law on Excise Duty);
- Mandatory admixture of 4.5-5% by volume of biofuel in fossil fuel of the total amount of end product;
- Promoting the final consumption of biofuel complying with the Sustainability criteria of Directive 2009/28/EC;
- RES utilization in the transport sector (Conversion of vehicles to use biofuel (biogas, vegetable oil, biodiesel, bio-
ethanol) planned in future).

According to the latest reports of the Ministry of Economics of the Republic of Latvia in 2012, there are likely to be many changes in the government support system to biofuel producers in Latvia.

3.7.4. Feedstock

Most of the country is composed of fertile lowland plains and moderate hills. A typical Latvian landscape is a mosaic of vast forests alternating with fields, farmsteads, and pastures. Agricultural land occupies 39% of Latvia’s territory. Available farmland is 2,429,800 ha: 1,805,500 ha are cultivated and 624,300 ha is abandoned land.3 Forests cover approximately 55% of Latvia’s territory.4

According to the Central Statistical Bureau data of 2010, the area of rapeseed sown accounted for about 109.5 thousand hectares, while the total production of rape in 2010 totaled 223.6 thousand tons. The area of rape sown in 2010 increased by 16.2 thousand ha or by 17.3%. Overall, total rapeseed production increased by 18.9 thousand tons or by 9.3%, despite the decline in the average yield of 21.9 quintals in 2009 to 20.4 ct in 2010. In the last three years the total area of rape sown has increased from 7.4% (2008) to 10.0% (2010). The sown areas of cereals accounted for 335.7 thousand ha, the total production

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of cereals was 1,416.8 thousand tons. Biofuel producers purchased 48.4 thousand tons of rape, 5.6 thousand tons of rapeseed oil, and 29.9 thousand tons of cereals from the domestic Latvian market, and 17.6 thousand tons of rape, 12.6 thousand tons of rapeseed oil, and 27.7 thousand tons of cereals from other countries.

Latvia still has enough unused land available to grow the raw materials for food and biofuel production. Available farmland is 2,429,800 ha: 1,805,500 ha are cultivated and 624,300 ha are abandoned land that is available for agricultural expansion.\(^5\)

### 3.7.5. Business Case

Current support in Latvia:

1) Direct support for biodiesel and bioethanol – biofuel producers are granted financially supported biofuel quotas. The total contribution shall not exceed the cost difference between fossil fuel retail prices and average production costs of biofuels.

In 2010, direct support for biofuels rates had the following scale:
- Biodiesel – LVL 0.39 per liter;
- Bioethanol – LVL 0.26 per liter;
- Bioethanol, if the candidate received the support for investment in manufacturing assets of other aid programmes – LVL 0.24 per liter.

2) Indirect public support (tax relief) to promote biofuels and fossil fuels with biofuel additions production and use. The law ‘On Excise Tax’ is intended to reduce the excise duty rates applied depending on the amount of biofuel in fuel:
- For mineral oils, the duty shall be calculated according to the following rates:
  - For unleaded petrol, the substitute products and components thereof (per 1000 liters) — 289 lats;
  - For leaded petrol, the substitute products and components thereof (per 1000 liters) — 320 lats;
- For diesel fuel (gas oil), the substitute products and components thereof (per 1000 liters) — 234 lats.

3. If for the products referred to in 1.1. in an excise goods warehouse in the Republic of Latvia, ethyl alcohol which is acquired from agricultural raw materials and which has been dehydrated (with alcohol content of at least 99.5% by volume) is added, for the relevant products (for 1000 liters) the duty shall be calculated – 86.7 lats.

4. For rapeseed oil, which is marketed or used for heating oil or fuel, and biodiesel fuel, which is totally acquired from rapeseed oil, the duty shall be calculated according to the rate – 0 lats per 1000 liters.

The total amount of state aid under the

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programme Biofuel Production and Use in Latvia from 2003-2010 was LVL 67.2 million.

3.7.6. Market Environment

The share of RES has traditionally been significant in Latvia’s energy supply and in 2008 it comprised 29.9% of the total final energy consumption. In the consumption structure for electricity, the RES segment is made up of hydropower plants, wind power plants, biogas power plants, and biomass power plants, as well as cogeneration stations utilizing RES.

In view of climatic conditions, heat supply is an important part of the quality of life of the Latvian population. Latvia is located in a climatic zone, where thermal power is required to not only ensure the quality of life, but also as a precondition to survival in the winter period which lasts for about 200 calendar days.

Heat supply to Latvian consumers is ensured by district heating systems, local heating and individual heating.

According to the State Revenue Service data, the following quantities of oil products (fuel), fuel containing bio-products and biofuel were sold in Latvia (see Table ‘Petroleum Products’)

From 2009-2011, the following amounts of biofuel were transferred to other EU Member States or exported (see Table ‘Biofuels Exported’)

In 2010, the total consumption of fuel, fuel containing bioproducts, and biofuels was 1062.95 thousand tons, which is about 1.66 thousand tons more than in 2009. In 2010, biofuels accounted for 2.96% of all petrol and diesel placed on the market. Compared to 2009, the share of biofuels increased by 2.48%. In 2010, Latvia exported approximately 30,401 thousand tons of biodiesel, or 70% of all domestically produced biodiesel to EU countries.

Quota of financial support for biofuel

<table>
<thead>
<tr>
<th>Table ‘Petroleum Products’: Total amount of petroleum products (fuel) placed on the Latvian market</th>
<th>2009 (t)*</th>
<th>2010 (t)*</th>
<th>2011 (t)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol</td>
<td>241,227</td>
<td>28,154</td>
<td>19,882</td>
</tr>
<tr>
<td>Petrol bio (E5)</td>
<td>80,347</td>
<td>260,143</td>
<td>235,177</td>
</tr>
<tr>
<td>Bio-petrol (E85)</td>
<td>28</td>
<td>56</td>
<td>120</td>
</tr>
<tr>
<td>Diesel fuel, including labelled (tagged) diesel</td>
<td>661,113</td>
<td>644,871</td>
<td>642,993</td>
</tr>
<tr>
<td>Biodiesel (B100)</td>
<td>1,179</td>
<td>1,723</td>
<td>865</td>
</tr>
<tr>
<td>Bio-diesel (B30)</td>
<td>0</td>
<td>335</td>
<td>11</td>
</tr>
<tr>
<td>Autogas</td>
<td>19,751</td>
<td>21,544</td>
<td>27,026</td>
</tr>
</tbody>
</table>

production in 2010 was given to two bioethanol plants with a total production capacity of 35.9 million liters per year and 7 biodiesel plants with a total production capacity of 236,080,282 liters per year.

Advantages:
- Good possibilities due to the growing obligatory share of biofuel in total fuel consumption;
- Latvia still has enough unused land available to grow the raw materials for food and biofuel production;
- Increase in minimum amounts of contamination will increase the demand for biofuels;
- Infrastructure is good enough for biofuel exports;
- Latvia has all preconditions to produce the biobutanol, bioethanol from lignocellulosic or second-generation biofuels and their raw materials;
- Cultivation of biofuel production continues to grow.

Disadvantages:
- Uncertainty about the state support in the future;
- There is no common strategy and no common support systems to enhance the popularity and consumption of biofuels in the country;
- Unstable prices of raw materials in Europe;
- Changing weather conditions affect yields.\(^6\)

### 3.7.7. Regulation

In accordance with the Republic of Latvia Cabinet Regulation No.772, adopted on the 18th October 2005, ‘Regulations Regarding Requirements for Biofuel Quality, Conformity Assessment, Market Supervision and Procedures for Consumer Information’ it is permitted to distribute the following biofuel to be used in internal combustion engines and blends of biofuel with fossil fuel which comply with the requirements specified in these Regulations:
- Biodiesel (B100) obtained from rape-seed oil;

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\(^6\) Latvian Biofuel Association. Interview with Dau-mants Znatnajs, Chairman of Latvian Biofuel Association

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Table 'Biofuels Exported': From 2009-2011, the following amounts of biofuel were transferred to other EU Member States or exported

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>2009 (t)*</th>
<th>2010 (t)*</th>
<th>2011 (t)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol bio (E5)</td>
<td>6,912</td>
<td>3,123</td>
<td>2,479</td>
</tr>
<tr>
<td>Biodiesel (B100)</td>
<td>61,049</td>
<td>30,401</td>
<td>45,196</td>
</tr>
<tr>
<td>Exported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biodiesel (B100)</td>
<td>5,139</td>
<td>1,329</td>
<td>1,661</td>
</tr>
</tbody>
</table>

Unleaded petrol to which dehydrated (alcohol strength by volume of at least 99.5%) bioethanol has been added (E5) if the content of absolute ethanol is 4.5-5% by volume of the total petrol volume;

- Diesel fuel (gas oil) (including A, B, C, D, E, and F category diesel for use in temperate climatic conditions, in compliance with LVS EN 590 standard Automotive Fuels – Diesel – Requirements and Test Methods) to which biodiesel obtained from rapeseed oil in the amount of 4.5-5% by volume of the total quantity of the end product has been added (B5);

- Diesel fuel (gas oil) to which biodiesel obtained from rapeseed oil in the amount of 30-30.5% by volume of the total volume of end product has been added (B30);

- Pure rapeseed oil and other unrefined or refined plant oils extracted from oil plants which can be used as fuel in special combustion engines;

- Unleaded petrol to which dehydrated (alcohol strength by volume of at least 99.5%) bioethanol if the content of the absolute ethanol is 70-85% by volume of the total petrol volume has been added (E85);

- Biogas – a gas that is produced from biomass and/or from the biodegradable fraction of waste and can be purified to quality equal to natural gas.

The Law on biofuels has been in force in Latvia since the 15th of April 2005.

The Cabinet Regulation No 648 of the 25th of June 2009 amending Cabinet Regulation No 332 of the 26th September 2000 on the conformity assessment of petrol and diesel entered into force on the 3rd of July 2009 and laid down that, as of the 1st October 2009, only diesel (including A, B, C, D, E, and F category diesel for use in temperate climatic conditions, in compliance with LVS EN 590:2005 standard Automotive Fuels – Diesel – Requirements and Test Methods) with biodiesel (obtained from rapeseed oil) content of 4.5-5% by volume of the total quantity of end product was permitted to be sold in Latvia. Additionally, petrol with Research Octane Number (RON) – 95 or greater, but less than 98, and Motor Octane Number (MON) – 85 or greater, but less than 89, and with alkenes (olefins) not exceeding 18% of the total volume of petrol (95 octane petrol), may only be sold if a bioethanol content of 4.5-5% by volume of the total volume of petrol has been added.

The obligatory admixture of 5% of biofuel does not, however, apply to Class 0, 1, 2, 3 and 4 diesel for use in the Arctic and severe winter conditions.7

Current support in Latvia:

1) Direct support for biodiesel and bioethanol – biofuel producers are granted financially supported biofuel quotas. The total contribution shall not exceed the cost difference between fossil fuel retail prices and average production costs of biofuels.

In 2010, direct support for biofuels rates had the following scale:

- Biodiesel - LVL 0.39 per liter;

4. For rapeseed oil, which is marketed or used for heating oil or fuel, and biodiesel fuel, which is totally acquired from rapeseed oil, the duty shall be calculated according to the rate 0 lats per 1000 liters.8

Regulations on Financially Eligible Quotas for Biofuels – producers of biofuels from rapeseed grains, rapeseed oil and grains are eligible for the support. The quota is shown in the Table ‘Biofuel Quotas’.

According to the latest reports of the Ministry of Economics of the Republic of Latvia in 2012 there is likely to be many changes in the government support system to biofuel producers in Latvia.

3.7.8. Project Financing

The ease of getting a loan from banks is very much dependent on the individual project. Each bank in Latvia has different credit conditions. In general, the interest rate for bioenergy projects equals the general average interest rate on the market. The interest rate of each project is influenced by several risk factors; thus, the key is definitely not the purpose of loan.


- Bioethanol – LVL 0.26 per liter;
- Bioethanol, if the candidate received the support for investment in manufacturing assets of other aid programmes – LVL 0.24 per liter.

2) Indirect public support (tax relief) to promote biofuels and fossil fuels with biofuel additions production and use. The law ‘On Excise Tax’ is intended to reduce the excise duty rates applied depending on the amount of biofuel in the fuel:

1. For mineral oils, the duty shall be calculated according to the following rates:
   - For unleaded petrol, the substitute products and components thereof (per 1000 liters) — 289 lats;
   - For leaded petrol, the substitute products and components thereof (per 1000 liters) — 320 lats;
   - For diesel fuel (gas oil), the substitute products and components thereof (per 1000 liters) — 234 lats;

2. If for the products referred to in 1.1. in an excise goods warehouse in the Republic of Latvia, ethyl alcohol which is acquired from agricultural raw materials and which has been dehydrated (with alcohol content of at least 99.5% by volume) is added, for the relevant products (for 1000 liters) the duty shall be calculated – 86.7 lats.

3. If to the relevant products referred in 1.3. in an excise goods warehouse in the Republic of Latvia rapeseed oil constitutes at least 30% of the total amount, the duty shall be calculated – 164 lats.
3.7.9. Readiness for Uptake

Biofuels are known to the general public. In the last four years there has been no public opposition to cause a decline in biofuel production.

There is the Latvian Biofuels Association which has five members in Latvia.

The Investment and Development Agency of Latvia (LIAA) is a state institution subordinate to the Ministry of Economics of the Republic of Latvia. The LIAA offers assistance throughout the process of setting up operations in Latvia, acting as a first point of contact and as a ‘one-stop-shop’ in assisting investors and in developing tailored solutions to meet their specific needs. The LIAA has its own regularly updated database of Latvian enterprises to facilitate partner searches for investment projects and for exporting or subcontracting businesses. The LIAA offers a matchmaking service, enabling potential investors and project partners to find suitable Latvian companies interested in M&A and joint venture opportunities.9

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<table>
<thead>
<tr>
<th>Biofuels</th>
<th>Unit</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioethanol</td>
<td>liter</td>
<td>27,848,101</td>
<td>34,177,215</td>
<td>35,005,570</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>liter</td>
<td>31,818,182</td>
<td>39,772,727</td>
<td>40,424,886</td>
</tr>
<tr>
<td>Total biofuels</td>
<td>liter</td>
<td>59,666,283</td>
<td>73,949,942</td>
<td>75,430,456</td>
</tr>
<tr>
<td>Share of biofuels</td>
<td>%</td>
<td>4.25</td>
<td>5</td>
<td>5.75</td>
</tr>
</tbody>
</table>

3.8. Finland

Bioenergy Association of Finland (FINBIO)

Text: Mr. Pekka-Juhani Kuitto (Executive Director, retired)
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Korkeakoskentie 17 D, 40500 Jyväskylä, Finland
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Email: mia.savolainen[at]finbio.fi

3.8.1. Country Score

Country Score Finland South - Biodiesel (November 2011)

In the general scoring for Biodiesel sector, Finland - South is rated place 38 out of total 81. The underlying categories that influence this result are displayed in the bar chart on the left hand side.

Country Score Finland South - Bioethanol (November 2011)

In the general scoring for Bioethanol sector, Finland - South is rated place 28 out of total 81. The underlying categories that influence this result are displayed in the bar chart on the left hand side.
3.8.2. Basic Data

Finland is a democratic republic in Northern Europe between 60 and 70 degrees north latitude. It is the seventh largest country in Europe with a total territory area of 338,424 km² (of this 69% forest, 10% waterways, 8% cultivated land and 13% other). The total population is 5.4 million. The capital and largest city is Helsinki (in capital area 1 million inhabitants). The population is mostly concentrated in the southern and central part of the country. About 80% of the population lives in urban areas.

Finland is the coldest country in the EU. Latitude is the principal influence on the country’s climate. On average, winter with snow lasts from mid December to mid March in the south, and from October to early May in the north. The vegetation zone is mainly characterised by boreal forest. The mean daily temperature in the capital Helsinki is minus 4°C in January and plus 18°C in June. In Northern Finland - also called ‘Lapland’ - temperatures may fall to minus 25-35°C in mid winter. However, because the Gulf Stream and the North Atlantic Drift Current moderate the climate, and because of the relatively low elevation of the land area, Finland contains half of the world’s arable land north of 60° northern latitude.

Finland is world famous for its large boreal forest and peatlands, and its global forest industry that comes therewith. Forestry land (incl. protected areas) is 228,000 km², of which 52% is owned by private families, 35% by the state, 8% by companies and 5% by others. The total volume of growing stock is 2,205 million m³ (solid), of which 50% is pine, 30% spruce and 20% non-coniferous. The annual growth is over 100 million m³ (solid) and annual fellings for industry purposes is 55 million m³ (solid). Total drain is 71,5 million³ (solid). These numbers are industrial round wood contents, without branches, tree tops, unmerchantable round wood and stump and root wood, which adds volumes around 20-40% more. Peatlands cover about 30% of Finland’s territory. Peat is growing more annually than it is used for energy purposes, about 25 TWh per year. Most often peat is mixed with wood based fuels or coal at power or CHP plants. It is good quality, indigenous and low price fuel. Companies also import raw wood.

There are 2.3 million hectares arable farm land in Finland. Wheat, barley and oats are the most produced crops in agriculture, but also potato and other root vegetables are very common. About 0.5-0.7 million hectares can be used for energy purposes.

The road- and railway network is quite large (main roads 460,000 km, also dense forest road network, railroad net is 5,800 km). The maximum total weight for trucks is 60 tonnes on public roads. Also dense water transport systems and routes on the seaways and lakes exist.

Finland’s economy provides reliable frameworks for living and business. Living standards are high. GDP per capita is 38,000 € (2011). Finland is:

- Number one in World Economic Forum...
2005 Competitiveness Rankings.¹

- One of the Least Corrupted Nations in the World (number one in 2007 and number two in 2011 / Transparency International).
- The Best Country in 2010 by Newsweek (indicators: education, healthiness, quality of life, economical dynamics and political frames).

Usefull links:
- Finland Statistics
- Common information
- Energy Statistics

3.8.3. Energy Policy

Finland is one of the world’s leading users of RES, especially bioenergy. RES provide one fourth of Finland’s total energy consumption and account for more than one fourth of its power generation. The country’s most important renewable source is forest: wood and wood-based fuels (solid and liquid) account for 80% of total renewables today. Other renewables are hydropower, wind power, ground heat and solar energy. Also peat is an important domestic fuel for district heat and power production.

Like other EU states, Finland has launched its renewable energy strategy and targets for 2020. Finland’s national action plan for promoting energy from renewable sources according to Directive 2009/28/EC² pursues the objective to increase the use of RES and their share of energy consumption. In addition to energy conservation, this is one of the most significant means by which the country’s climate targets can be achieved. In use, RES do not increase carbon dioxide emissions, but create employment, promote regional policy goals, and enhance energy supply security. The strategy also supports sector technology trade for the industry, which have already become an important part of Finnish exports and domestic business.

Finland’s national target is to increase the use of renewables by 9.5% units to a total of 38% in 2020. Bioenergy has a major role. Achieving the target by 38% entails an increase in the use of renewable energy of approximately 40 TWh compared to 2005, when renewable energy use accounted for 28.5%. One particular target within this national action plan is for renewables to account for at least 20% of transportation fuels by 2020, taking into account the double counting referred to in the RES Directive. The total renewable energy target is to use 124 TWh generated from RES in 2020 (85 TWh for heating and cooling, 33 TWh for electricity and 6.5-7 TWh in traffic) of which bioenergy is 105 TWh. This will translate to a minimum of 9 500-10 000 additional jobs in the bioenergy sector by 2020. The key targets are to in-

¹ www.weforum.org

² http://ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm
There is a new feed-in tariff for renewable electricity, annually financed from the State budget (Act 1396/2010). The tariff applies to new large and medium power plants fuelled by wind, biogas, forest chips and wood-based fuels. Also public investment grants for energy plants are used along with other incentives in the power and heat sector.

The support of the biofuel sector has only been on the agenda of political decision makers for a few years. But hopefully, the remaining administrative barriers will be vanished soon. Already the blend markets for petrol and diesel fuels have started to emerge. The obligatory blend act for fuel producers is in place and the blending of biofuels with mineral oils will continue more strongly in the years to come. The blend markets for petrol and diesel fuels have started to emerge. The obligatory blend act for fuel producers is in place and the blending of biofuels with mineral oils will continue more strongly in the years to come. The blend markets for petrol and diesel fuels have started to emerge. The obligatory blend act for fuel producers is in place and the blending of biofuels with mineral oils will continue more strongly in the years to come. The blend markets for petrol and diesel fuels have started to emerge. The obligatory blend act for fuel producers is in place and the blending of biofuels with mineral oils will continue more strongly in the years to come. The blend markets for petrol and diesel fuels have started to emerge. The obligatory blend act for fuel producers is in place and the blending of biofuels with mineral oils will continue more strongly in the years to come. The blend markets for petrol and diesel fuels have started to emerge. The obligatory blend act for fuel producers is in place and the blending of biofuels with mineral oils will continue more strongly in the years to come.

In addition, all counties in Finland have set up their own areal biomass use strategies up to 2015 and 2020, even most of cities and municipalities have done so. More information can be found via related associations and biomass areal organizations.

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3 Finland’s National Renewable Action Plan 2020

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6 www.st1.fi
Usefull links:

- Finland’s National Renewable Action Plan 2020
- Ministry of Employment and the Economy
- Association Bioenergia with its members
- Motiva Ltd
- Benet Ltd
- Josek Ltd
- Finnish Energy Industries

3.8.4. Feedstocks

An efficient and balanced energy system is crucial. Currently, the most important domestic energy sources are wood fuels, peat and hydropower; however, the range is widening to also include wind, biogas, agricultural biomass, biofuels for transport, and heat pumps. The use of wood fuels is growing the most. However, 70% of energy used in Finland today is imported and 30% from domestic production. There is no domestic coal, oil or natural gas sources in Finland, and thus all fossil fuels have to be imported.

In Finland, the largest biomass reserves are based on forest wood. Forestland covers 69% of Finland’s territory. Annual growth is over 100 million m³ (solid) and annual fellings for industry purposes is 55 million m³ (solid), total drain is 71.5 million m³ (solid). These numbers are industrial roundwood contents, without branches, tree tops, small non-industrial roundwood and stump, as well as root wood, which adds around 20-40% more volume. Almost 95% of forest area is certified by the Finnish Forest Certification system (FFCS) which is based on the PEFC system. Also Forest Stewardship Council’s (FCS) certification is largely used. Wood is the most important source of bioenergy, representing 22% of the total energy consumption. 86 TWh of wood energy was used in 2011 (liquid 37 TWh and solid 49 TWh), which constitutes 22% of the total energy consumption. Most of the wood-based energy (56%) is recovered from industrial by-products and residues, and the rest straight from the forest.

There is huge forest energy potential that still remains unused. According to the estimation surveys, the theoretical maximum production potential of forest wood fuel is 45 million m³ per annum (without pulp industry’s black liquor and forest industry’s by-products). This potential corresponds to approximately 90 TWh. However, the practical target is to increase the annual use of wood chips to 25 MWh (to 13.5 million m³) and to heighten the use of firewood in small scale heat so that it will present at least a level of 12-13 TWh by 2020.7 Some 7.5 million m³ (solid) of wood chips were used in 2011. Nowadays, forest chips consist of logging residues (36%), small-diameter trees (29%), stumps (15%), and round wood (20%).

Biorefinery plants can also use logging residues as raw material in liquid biofuel production. The construction of the first so-called second generation biorefinery will be implemented in the near future in 7 nREAP and Finnish Forest Research Institute, www.metla.fi
Finland, if the Commission put enough NER funds to the large investment project. One large plant needs around 0.5-1.5 TWh wood fuels as a raw material annually.

Peatlands cover about 30% of Finland’s territory. Peat is used for energy generation and it is growing annually more than it is being used (25 TWh/year). It is good quality fuel, domestic and comes at a low price. Both wood and peat are potential raw materials for liquid biofuels in the transport sector.

The total use of agricultural residues and energy crops has been minor. Finland has 2.3 million hectares arable farm land, of which 1.17 million hectares are used for food crops and 0.64 million hectares for fodder. Approximately 0.1 million hectares are used for the cultivation of oil plants. About 0.5-0.7 million hectares could be used for energy purposes without posing a threat to food production. During the last fifteen years, reed canary grass has been studied as an energy source. The field area for reed canary grass is about 20 000 hectares. FINBIO has made a target for utilizing of different kind of energy crops. If 0.5 million hectares were used and the assumed harvest yield was 20 MWh/ha, it would correspond to a total potential of 10 TWh. Annual crop yield of straw has been estimated to be 2.1 million tons. If the techno-economic potential from the total potential is 20%, it translates to 400,000 tons per year. Despite the potential being rather large, it is estimated that 2.5 TWh can be easily taken and 7 TWh when taking 20% of straw potential into energy use. In addition, the potentials of waste, recycled fuels, and biogas for energy use are relatively large.

Today, the most common raw materials for biofuels (bioethanol, biodiesel) are agricultural biomass, such as turnip, rape, barley, by-products and wastes from food industry. Company Neste Oil Ltd produces high volumes hydro-treated biodiesel worldwide from palm oil.

Usefull links:
- Finland Official Statistics
- Energy statistics
- Bioenergy statistics: www.finbioenergy.fi and www.bioenergia.fi
- Forestry statistics: www.metla.fi and www.smy.fi
- Agricultural Statistics
- European Bioenergy statistics

3.8.5. Business Case

In 2011, the transport sector represented 24% of final energy consumption in Finland. The Finnish official vehicle register contains 5.5 million vehicles, of which 3.5 million were automobiles. There are 2.98 million passenger cars (80% petrol and 20% diesel cars) and the rest were other cars, like trucks, bus, etc. Today over 6% of traffic fuels on the road are already bio-based. The 2020 target is 20%. Thus, the annual use of biofuels will increase from 160 000 tons to 730,000 tons in 2020 (taking into account the double counting referred to in the RES Directive). The total biodiesel production
in Finland is 288,000 tons annually and its capacity is 340,000 tons (mainly hydro-treated NExBTL biodiesel).

All petrol cars in Finland are already using petrol blended with bioethanol (the most common is 95 octane E10 petrol containing up to 10% v/v ethanol; older cars use 98 octane E5 petrol containing up to 5% v/v ethanol). Ethanol fuel E85 that is cleared for use in Flexible Fuel Vehicles can be found only in some parts of the country, mainly in the south of Finland, and that car fleet is still quite small (only few hundred). Biodiesel suits almost into every car in high mix. The use of biodiesel and biogas for traffic purposes are increasing and there are plenty of market possibilities; nevertheless, biogas cars still only play a marginal role (about 800 (they use also natural gas network)). There are still administrative barriers for biogas and E85 bio-petrol. Special efforts will be put to the large scale production of second generation biodiesel. Raw material will be mainly forest felling residues.

The consumption of fossil petrol has stabilized, but the consumption of diesel fuel has further increased. Neste Ltd has a large oil refinery plant in the city Porvoo in Southern Finland. Mineral oil is imported to the plant. Today also palm oil is imported from Far East plantations to Neste Ltd’s NExBTL biodiesel plants into Finland, Rotterdam and Singapore.

The production of bioethanol has reached the level in which almost every gasoline car owners can use E10 bio-blended gasoline. The fuel tax reform of 2011 supported this development but only marginally. Due to tax policy that the state has pursued during decades, the cars in Finland are older than the average in Europe. However, the trend has started. One large biorefinery plant is currently under planning, and will be implemented if the Commission will admit enough NER to fund this large project. The product will be second generation biodiesel and raw material mainly from forest logging residues.

Estimations show that it would be possible to also build also two or three additional bioethanol plants (producing 120,000-150,000 tons) using cereals as fuel material without compromising the food industry’s operation and its supply of raw materials. This quantity could cover some 15% of the 2020 biofuel target. Production would take place on a commercial basis; however some €120 million of the investment could be financed by means of normal aid to businesses. One precondition for the support is that cereals-based bioethanol complies with the sustainability criterias laid down in the RES Directive.

Usefull links:
- Bioenergia Association with its members
- Ministry of Employment and the Economy - Energy
- Ministry of Agriculture and Forestry
- Statistics Finland
3.8.6. Market Environment

During the years 2002-2004, the consumption of biofuels was based on fixed term pilot projects where bioethanol was used in blends with petrol. In addition, small-scale trials on the production of biodiesel and biogas for use as a transportation fuel have also been carried out. After these pilot projects the consumption of biofuels dropped to zero in 2005. However, this was the starting point for the state actions for new energy and environment strategies. In 2009, 7 PJ (bioethanol 75% and biodiesel 25%) of biofuels were already used in the transport sector.

For biofuels, the availability and prices of biomass raw materials, logistics and other production costs are a crucial factor for their competitiveness, especially with regards to fossil fuels. Finland has to increase its biofuel consumption remarkably to meet the 2020 target of 20% RES in the transport sector (taking into account the double counting referred to in the RES Directive). The total amount of fuel in the transport sector is estimated to be 150 PJ in 2020; thus, at least 20-30 PJ of biofuels are needed in order to reach the RES target. In recent years, a significant capacity for production of biofuels has been constructed in Finland, covering bio-ETBE, hydro-treated biodiesel (NExBTL) and bio-ethanol. In the year 2010, around 7.5 PJ (6%) biofuels were used.

The Finnish oil company Neste Ltd\(^9\) has a large mineral oil refinery plant in the city Porvoo. In addition, there are two biodiesel plants (NExBTL) both with capacities of 0.17 million tons. The company has also two larger NExBTL refineries, with annual production of 0.8 million tons both, situated in Rotterdam and in Singapore. They were completed in 2010 and 2011. The raw material used is palm oil that is imported from Far East plantations. Neste blends biodiesel to the mineral diesel and either sells it in the Neste fuelling stations to customers and to other producers, or exports it. In the Helsinki area a three-year experiment was conducted where buses with 25% NExBTL diesel were run at first, before being switched to 100% in 2008. Also in during winter no problems occurred. Especially the Finnish oil company ST1\(^10\) produces bioethanol from by-products and biowastes from the food industry etc. The company has made pioneering developing work in the area and sells bioethanol to the customers in its fuelling stations. In Finland, bioethanol is produced from non-cellulosic raw materials, such as by-products and waste streams of the food industry. It is produced by the fermentation of plants rich in sugar/starch. The first so-called second generation biorefinery plant is planned and being realized in the near future, if the Commission admits enough NER. One plant needs around 0.5-1.5 TWh biomass annually as a raw material. Bio-refineries use for instance logging residues as a raw material for its liquid biofuel production.

\(^9\) www.neste.com
\(^10\) www.st1.fi
3.8.7. Regulation

Taxation is one of the main instruments used to battle climate change. If a well thought-through tax reform was put in place, it could be a powerful tool for steering the BAU business towards the aspired targets. In order to promote the use of biofuels in the transport sector, the government changed the structure of fuel taxes in 2011. The taxation takes account of the volumetric energy content of the fuel. The tax component is levied on both fossil and biofuels, based on the same taxation. It also includes components for carbon dioxide emissions and local/particle emissions that have adverse health effects. The CO$_2$ tax component is based on the CO$_2$ emissions of the fuel in question.

In addition to the energy tax, a security of supply fee is charged for energy products. The basic maximum price was set to the price of fossil petroleum on quite a low level, and other fuels including biofuels was set under it and between narrow margins. The new fuel taxation act was launched in the beginning of 2011. The electricity tax for industry (tax class II) has been raised from €0.263 c/kWh to €0.703 c/kWh, electricity tax class I is for private customers. During the transport sector tax reform the government launched also the special tax for biofuel cars, which bioenergy associations try to hinder. New fuel taxes are presented in the Table ‘Energy Taxes’.

The European Union aims to harmonize energy taxation in the member states.

A new obligatory blend act for fuel producers was set into action in 2011, and the blending of biofuels with mineral oils will continue to grow in the years to come.$^{11}$ The target is to increase the biofuel use in the transport sector from zero (2005) up to 5.3 TWh/25 PJ by 2020 (20% of the total use). In 2009, the use of biofuels in transport was 7 PJ, and the target, which was reached in 2010, was 5.75%.

There exist different types of technical regulations and emission limits for power/CHP/DH/heat sector and also for different types of cars and biofuels. Further information I provided by the association Bioenergia.

Usefull links:
- Finland’s National Renewable Action Plan 2020
- Laws in Finland
- Ministry of Employment and the Economy
- Association Bioenergia with its members

3.8.8. Project Financing

Finland is a member of the Eurozone; hence, currency exchange risks for investors from other Eurozone countries are low. Finland’s economy is rated with one of the best scores at Standard & Poor’s and Moody’s.$^{12}$ In addition, Finland was number one in World Economic Forum 2005 Competitiveness Rankings.$^{13}$

13 www.weforum.org
Table ‘Energy Taxes’; Energy taxes related to traffic and heating fuels and electricity consumption (January 2011)

<table>
<thead>
<tr>
<th>Product</th>
<th>Unit</th>
<th>Energy tax</th>
<th>CO₂-tax</th>
<th>Security of supply fee</th>
<th>Total</th>
</tr>
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<tr>
<td>Motor petrol</td>
<td>EUR c/l</td>
<td>50.36</td>
<td>11.66</td>
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<td>Bioethanol</td>
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<td>37.56</td>
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<td>Bioethanol T</td>
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<td>0.68</td>
<td>33.73</td>
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<tr>
<td>MTBE</td>
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<td>51.07</td>
</tr>
<tr>
<td>MTBE R</td>
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<td>8.43</td>
<td>0.68</td>
<td>50.02</td>
</tr>
<tr>
<td>MTBE T</td>
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<td>0.68</td>
<td>48.98</td>
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<td>TAME</td>
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<td>0.68</td>
<td>54.95</td>
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<td>ETBE</td>
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<td>0.68</td>
<td>50.11</td>
</tr>
<tr>
<td>ETBE R</td>
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<td>8.02</td>
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<td>51.19</td>
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<td>Bioalcohol</td>
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<tr>
<td>Biogasoline R</td>
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<td>Diesel oil</td>
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<td>30.70</td>
<td>13.25</td>
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<td>Diesel oil para</td>
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<td>24.00</td>
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<td>34.56</td>
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<td>0.35</td>
<td>28.49</td>
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<tr>
<td>Biodiesel P</td>
<td>EUR c/l</td>
<td>24.00</td>
<td>12.51</td>
<td>0.35</td>
<td>36.86</td>
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<td>6.26</td>
<td>0.35</td>
<td>30.61</td>
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<tr>
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<td>24.35</td>
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<td>Light fuel oil</td>
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<td>10.35</td>
<td>8.00</td>
<td>0.35</td>
<td>18.70</td>
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<tr>
<td>Light fuel oil, without sulphur</td>
<td>EUR c/l</td>
<td>7.70</td>
<td>8.00</td>
<td>0.35</td>
<td>16.05</td>
</tr>
<tr>
<td>Bio oil EUR</td>
<td>EUR c/l</td>
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<td>8.00</td>
<td>0.35</td>
<td>16.05</td>
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<tr>
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<td>4.00</td>
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</tr>
<tr>
<td>Bio oil T</td>
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<td>0.00</td>
<td>0.35</td>
<td>8.05</td>
</tr>
<tr>
<td>Heavy fuel oil</td>
<td>EUR c/kg</td>
<td>54.75</td>
<td>12.74</td>
<td>0.35</td>
<td>67.85</td>
</tr>
<tr>
<td>Coal</td>
<td>EUR/t</td>
<td>54.54</td>
<td>72.37</td>
<td>1.18</td>
<td>128.09</td>
</tr>
<tr>
<td>Natural gas</td>
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<td>5.94</td>
<td>0.08</td>
<td>12.22</td>
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<td>Electricity, class I</td>
<td>c/kWh</td>
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<td>Electricity, class II</td>
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<td>0.703</td>
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<td>Traf Oil</td>
<td>c/kg</td>
<td>18.79</td>
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<td>Fuel cost **</td>
<td>EUR/MWh</td>
<td>3.90</td>
<td>0.00</td>
<td>3.90</td>
<td></td>
</tr>
</tbody>
</table>

**Energy tax for fuel cost is 1.90 €/MWh during 2011-2012 and 2.90 €/MWh during 2013-2014.
R = product includes renewable raw material according to directive 2001/77/EC.
T = product includes renewable raw material according to directive 2001/77/EC and it produced from waste or residues which are not suitable for food like lignocellulosic material.
P= paraffin diesel oil.
and one of the Least Corrupted Nations in the World: number one in 2007 and number two in 2011.\textsuperscript{14} Finland’s credit rating is AAA. GDP per capita is 38 000 € (2011).

There are plenty of international and national banks situated in Finland. Loan interest levels are rather low but variable. Common VAT is 23\% but companies have possibilities to be rebated.

The easiness of getting a credit by banks is very much dependent on individual projects. Banks are familiar with bioenergy, and projects with renewables are highlighted in the bank sector and state funding. Different kinds of R&D, demonstration and invest programs exist in the state level but also in the counties. The best approach is to first get in contact with related energy and bioenergy associations. Information about average fuel prices have been collected by official organization Statistics Finland\textsuperscript{15}. This sort of information is also published on special electrical market places, as wellas in “Bioenergia” magazine\textsuperscript{16}, which is published six times per year. The so-called PIX-Index by FOEX Indexes Ltd\textsuperscript{17} shows the monthly prices of wood fuel chips, pellets, pulp, paper, paperboard, etc. in the Nordic markets.

Finpro\textsuperscript{18} trade supporting organization has 400 professionals in almost 50 countries. It opens up future business opportunities by understanding changes in international markets. It serves clients by enabling them to be in the right markets at the right time with a competitive concept and offering. The Finnish Funding Agency for Technology and Innovation, Tekes\textsuperscript{19}, is the main public financer of technology R&D. Renewable energy technologies, belonging to sustainable development solutions, are in the strategic focus of Tekes. Various national programmes and demonstration projects have involved RES technologies during the last decades, the main focus being on bioenergy.

The specific energy project financing institution is the Ministry of Employment and the Economy.\textsuperscript{20} It offers different kinds of support in the financing, investing and development of projects of renewable energy projects in Finland. The maximum energy subsidy per cents granted by the Ministry of Employment and the Economy are 40\% when investments are targeted at new technologies or energy saving appliances at plants using renewables. The subsidy is at 30\% when investments flow into ordinary technologies or technologies that decrease environmental damages. Typical public energy grants range from 10-15\% for heating plants, from 15-20\% for landfill gas plant, and from 10-20\% for wood chips or industrial waste wood production machineries etc. Ministry of Agriculture and Forestry\textsuperscript{21} offers develop programs and funds for forestry and agricultural missions and especially for the projects in farm sector.

\textsuperscript{14} http://cpi.transparency.org/cpi2011/results/
\textsuperscript{15} www.stat.fi
\textsuperscript{16} www.bioenergia.fi
\textsuperscript{17} www.foex.fi
\textsuperscript{18} www.finpro.fi
\textsuperscript{19} www.tekes.fi
\textsuperscript{20} www.tem.fi
\textsuperscript{21} www.mmm.fi
Usefull links:

- Ministry for Foreign Affairs of Finland
- Ministry of Employment and the Economy
- Ministry of Agriculture and Forestry
- Association Bioenergia with its members
- Benet Ltd
- Josek Ltd
- Finpro
- Tekes
- Finnish Energy Industries
- Statistics Finland
- Fuel PIX-Indexes

3.8.9. Readiness for Uptake

Finland is one of the world’s leading users of RES, especially in the power and heat sector. Also in the transportation sector there are huge biomass potentials from forest residues, agricultural by-products and wastes, as well as biowastes from industry and municipalities. Today, the total biodiesel production in Finland is 288,000 tons per year and the capacity even amounts to 340,000 tons (mainly hydro-treated NExBTL biodiesel). The production of bioethanol has reached the level in which almost every gasoline car owners can use E10 bio-blended gasoline.

It is easy to contact companies and public authorities when you are planning a cross border project or looking for partnership possibilities with Finnish companies. When planning to investments or starting partnership negotiations, it is best to first contact related associations.

Usefull links:

Facts and Figures:

- Finland’s National Action Plan for promoting energy from renewable sources pursuant to Directive 2009/28/EC
- Official Finnish Statistics
- Common information
- Energy Statistics in Finland
- European Biomass Statistics
- European Forestry Statistics
- Forestry Statistics in Finland
- Forest Industry Statistics
- Price indexes for wood based fuels and forestry products in Nordic
- European Biomass Supply Chains
- Renewable Heating and Cooling - European Technology Platform

Associations and main biomass development organizations in small scale sector:

- Association Bioenergia
- Finnish Energy Industries
- Finnish Biogas Association
- Motiva Ltd, small scale use
- Benet Ltd, Central and Southern Finland
- Josek Ltd, Eastern Finland
- The Bioenergy Development Center BDC
- Forestry R&D in Finland: Finnish Fo-
rest Research Institute

- Energy R&D in Finland: VTT Technical Research Centre of Finland
- Agriculture Statistics and R&D in Finland
- Forest areal projects

Institutions:
- Ministry of Employment and the Economy - Energy
- Ministry of Agriculture and Forestry
- Ministry for Foreign Affairs of Finland
- State level R&D: Tekes

Companies:
There are hundreds of energy and bioenergy producing companies as well as technology manufacture companies. Internet addresses exist under Associations links.
4. **Annex**

**Leading questions of the biogas-market handbook:**

1. **Country profile (geography, demographics, logistics, etc.)**
   1.1 Geography and Climate
   - Total land area
   - What is the average summer temperature across regions in target country over the last 10 years?
   - Total number of inhabitants
   - Population density
   - Total number of personal transport vehicles

1.2 Wealth/economic status of population
   - What was the average GDP real growth rate between 2008 - 2010?
   - GDP per capita for 2010

1.3 Logistics - road and rail network
   - What is the density of rail-network?
   - What is the density of road-network?
   - What is the density of water ways-network?
   - What is the density of the electricity transmission and distribution networks?
   - What is the density of the gas transmission and distribution networks?

2. **Energy Policy (political will, nREAP, etc.)**
   2.1 The nREAP is ambitious and proposes appropriate measures
   - There are high-volume targets for RES
   - There are high-volume targets for biofuels
   - Proposed measures for biofuels in nREAP are appropriate and convincing

2.2 A political will to develop the RES-sector is clearly recognisable and stable
   - Does the government provide an appropriate budget for the targeted market growth for Biofuels?
   - Have the support schemes/framework conditions for investments in biofuels changed within the last 2-4 years?
• Is a revision of the framework conditions announced, which could affect the biofuels market development?

2.3 Proximity of elections
• What is the period of time before the next general (national) elections.

3. Feedstocks
3.1 The agricultural structure is beneficial for biogas and/or biofuel projects
• What is the available farmland per inhabitant?

3.2 Feedstocks are available for biofuel production
• Amount of oil seeds produced nationally in 2010
• Amount of organic wastes and residues (waste vegetable oil + fats) in 2010

3.3 The solid biomass potential is sufficient to realise small scale heat/CHP/DH projects?
• Amount of domestic demand for cereal for biofuels in 2010
• Amount of domestic demand for oil grain for biofuels in 2010
• Share of oil grain demand for biofuels compared with total domestic production
• Did the cereal production of 2010 exceed the domestic demand?
• Did the oil seed production of 2010 exceed the domestic demand?
• Area of fallow/abandoned land available for agricultural expansion

4. Economic instruments (prices, support schemes/guarantee, subsidies, etc.)
4.1 Financial support schemes can be claimed for investments
• What proportion of the investment in biofuel production plants can be claimed in subsidies (cumulative, including tax advantages)?
• When does the scheme end granting funding for biofuel production plants?
• Subsidies for investments in logistic/Infrastructure for high blend/pure biofuels are in place
• Investment subsidies for green vehicles procurements are in place

4.2 Financial support schemes can be claimed for operation
• Tax is reduced for bioethanol in high blends (E85)
• Tax is reduced for bioethanol in low blends (E5,E10)
• Tax is reduced for biodiesel in pure/high blends (B30 - B100)
• Tax is reduced for biodiesel in low blends (B5,B7)

4.3 Prices of fossil fuels are high and heavily taxed
• What is the average end customers price for petrol fuel over the last year (2010)?
• What is the average end customers price for fossil diesel over the last year (2010)?
• How high is the total energy tax on petrol fuel to the end consumer?
• How high is the total energy tax on fossil diesel to the end consumer?

5. Market aspects (volume, access to grid, etc.)
5.1 The energy sector is large and expected to grow
• Amount of diesel used for road transport
• Expected growth in diesel use from 2009 to 2020
• Amount of petrol fuel used for road transport
• Expected growth in use of petrol fuel from 2009 to 2020

5.2 Access to the electricity grid is guaranteed
• Is there in general an electricity grid available with sufficient capacity?
• Is there in general an electricity grid available with regulated grid access?
• Is there in general an electricity grid available with regulated costs for grid connection?
• Is there in general an electricity grid available with priority for RES?
• Is the grid operator obliged to connect all renewable energy installations?

5.3 The Framework conditions for fossil fuels do not impair market development
• What is the contribution of imported oil to primary energy supply in real terms?
• What is the percentage contribution of imported oil to primary energy supply?

5.4 Availability of energy to supply a biofuels plant is not problematic
• How reliable is the electricity supply?
• Supply of excess electricity classed as “green” from biofuel plant is possible
• Electrical distribution networks can cope with increased energy feed-in from biofuel plants
• What is the share of biofuels compared to total road fuels
• How does the national total amount of ethanol consumed compare to the target for 2020 (NREAP)?
• How does the national total amount of bio-diesel consumed compare to the target for 2020 (NREAP)?
• What is the ethanol consumption growth rate in the last 4 years (CAGR)
• What is the biodiesel consumption growth rate in the last 4 years (CAGR)

5.5 Biofuel has access to competitive downstream flow
• Logistics available for high blend / pure biofuels (e.g. B100 or E85 filling stations)?

5.6 An intense competition is not recognisable
• Number of competitors providing (already building or selling) ethanol production plants
• Number of competitors providing (already building or selling) biodiesel production plants
• Number of established distributors already (re-)selling biofuel bought in national and international markets
• Total amount of bioethanol capacity sold (by existing competitors) over the last 4 years
• Total amount of biodiesel capacity sold (by existing competitors) over the last 4 years

6. Regulations (laws/mandatory targets for bioenergy, permitting, emission thresholds, etc.)
6.1 Regulatory instruments to support bioenergy markets have successfully been introduced
• Obligation for inclusion of biofuel as proportion of all transport fuels in market
• Obligation for inclusion of a specific quantity of biofuel (per litre) in total fuel consumption is in place
• Obligation for inclusion of biodiesel as a proportion of total diesel consumption is in place
• Obligation for inclusion of a specific quality of biodiesel in total diesel consumption is in place
• Obligation for inclusion of bioethanol as a proportion of total petrol consumption is
in place

- Obligation for inclusion of a specific quantity of bioethanol in total petrol consumption is in place

6.2 The approval procedure by the authorities is adequate in terms of time

- How long does the approval process last in average for biofuel production plants

6.3 Specific regulations are favourable for bioenergy market developments

- National biofuel standardisation and certification schemes for sustainability in place
- National biofuel standardization allows for low blends (e.g. E10:B7)
- National biofuel standardization allows for pure blends (E85:B100)

6.4 Existing emission thresholds can be fulfilled with the applied technology

- Extra information Biofuels

7. Project financing context (economic situation, loan, banks, etc.)

7.1 The country has a solid financial position

- Standard and poors rating

7.2 Export friendliness

- Euler Hermes rating

7.3 Level of transparency in the market

- Corruption perception index

7.4 Country risk

- Country risk as reflected by the rating country of COFACE

7.5 Ease of doing business

- Ranking of feasibility of “starting a business” in the IFC-World Bank Doing Business Index
- Ranking of Feasibility of “getting credit” in the IFC-World Bank Doing Business Index

7.6 The banks are familiar with bioenergy technology and support its development
• Is the support of bioenergy projects highlighted in official papers of the banks, like annual reports etc.?

• Are Governmental guarantees for loans for bioenergy investments in place?

7.7 Foreign investments are supported in the target country
• Are there any programmes implemented in the region to attract foreign investments?

7.8 The banks in the target country provide attractive conditions for bioenergy projects
• Can bioenergy plants benefit from interest rates for credits lower than usual in the market?
• Are the support conditions feasible in an adequate scope?

7.9 The market is liquid and transparent
• Extra information Biofuels

7.10 The value of the investment is stable due to a low currency exchange risk
• Is the market part of the Euro Zone?
• Was the inflation rate of the country more or less stable within the last 4 years (CAGR)?

8. Readiness for uptake (public acceptance, stakeholder networks, etc.)

8.1 Efficient networks and information are accessible
• National and regional agencies are providing effective help to foreign companies wishing to invest
  • Is there a biofuels association (with a minimum of 10 company members) assisting the market?
  • Public websites/information/market reports on bioenergy

8.2 Public acceptance/knowledge of technology
• Are biofuels known to and well-regarded by general public?
• Have any biofuel production project permissions been declined due to public opposition in the last four years?
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