The Biofuel Market in Austria – Prospects for Central Eastern Europe

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BLUEWATERS
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Competence – Markets – Speed
Biofuels relevant

- FAME – fatty acid methyl ester (biodiesel)
- Biogas
- Bioethanol
- Biodimethylether
- Bio ETBE (ethyl-tertio-butyl-ether)
- Bio-MTBE (methyl-tertio-butyl-ether)
- Synthetic biofuels
- Biohydrogen
- Pure vegetable oil
Promotion of biofuels in the transport sector in Austria

- **Tax exemption**
  - *Article 4(1)(7) of the mineral oil tax law provides tax exemption for fuels produced from biogenic substances*
  - *Blending of up to 2% diesel is also exempt from law*
  - *Tax reduction for blending of up to 5% biogenic fuels with petrol*

- **Substitution requirement**
  - *Persons who are liable to tax for petrol or diesel must substitute 2.50% of the total energy content of the petrol and diesel placed on the market in the transport sector each year*
  - *Proportion must increase to 4.30% from 1 April 2007*
  - *Proportion must increase to 5.75% from 1 April 2008*
National Resources

- Biodiesel
  - 9 large scale and 3 pilot plants with a total capacity of 100,000 t/year
- Ethanol:
  - Currently no larger plant in operation
  - Plant under construction in Wr. Neustadt, 200,000 cm³ gas/yr, investment: 105 Mio Euro
- Biogas:
  - 34.5 Mio cm³ from 141 agricultural installations in 2003
  - 170 mio cm³ from waste and sludge treatment in 2003
  - All biogas is converted directly in electricity
Prognosis on Quantities

Statement/Prognosis of the required quantities of biofuels based on achieving the Austrian objectives, assumption: with only biodiesel and ethanol

<table>
<thead>
<tr>
<th></th>
<th>Biodiesel</th>
<th>Ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>220 900 tonnes</td>
<td>-</td>
</tr>
<tr>
<td>2007</td>
<td>317 500 tonnes</td>
<td>120 200 tonnes</td>
</tr>
<tr>
<td>2008</td>
<td>481 900 tonnes</td>
<td>150 000 tonnes</td>
</tr>
</tbody>
</table>

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Biodiesel plants in Austria

Competence – Markets – Speed
Bio-diesel is an environmentally friendly fuel. It emits as much CO₂ as plants have absorbed during their growth when burnt. It is made of reproducible raw materials. It reduces the hydrocarbon emission. It has high lubricity and protects the motor. It is sulphur-free (<0.001%). It does not contain benzol or other aroma. It is biodegradable and is not harmful to soil and ground water in accidents. It is an environmentally friendly alternative to conventional diesel. It does not belong to dangerous goods (ignition point at 170°).
Proven lower emissions

source: TÜV-Germany

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Creation of regional value chains

Products and by-products within the biodiesel value chain considerably enhance the regional productivity, investments will help the local agricultural sector.

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Competence – Markets – Speed

Mass Balance – Austrian technology

BIO DIESEL – Production plant

- Rape seed
  - 90,500 t/a
- Oil press
  - 31,500 t/a
- Rape seed oil (degummed)
  - 31,500 t/a
- Rape seed Cake
  - 58,500 t/a
- Raw Glycerine
  - 8,400 t/a
- biodiesel
  - 30,000 t/a

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Austrian Technological scheme of a biodiesel plant according to European standards

 Competence – Markets – Speed
Bio-Diesel applications in Austria

Clean City Management

Taxi fleets

Bio-Diesel is 98% bio-degradable within 21 days!

Ecological sensitive areas

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Quality standards of Bio-Diesel

In 1991 the first Bio-Diesel Quality Standard (Ö-Norm C 1190) was laid down.

Other countries followed this example:

- Cech Republic: CN 656507 (1994)
- Sweden: SS 155436 (1996)
- USA: SAE 971687 (1996)
- Germany: DIN E 51606 (1997)

In 2002/2003 the same European Standard for Fatty Acid methyl Ester (FAME) was introduced.
### Raw Materials

<table>
<thead>
<tr>
<th>Vegetable oils from</th>
<th>Animal fats from:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sunflower</td>
<td>• Fowl</td>
</tr>
<tr>
<td>• Rape seed</td>
<td>• Cattle</td>
</tr>
<tr>
<td>• Palm oil</td>
<td>• Pigs</td>
</tr>
<tr>
<td>• Cotton seeds</td>
<td></td>
</tr>
<tr>
<td>• Cynaria</td>
<td></td>
</tr>
</tbody>
</table>

But also

**Used cooking oil**

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Biofuels Project Model

Owner / Sponsor / Investor

Feedstock
- Vegetable oils
- Waste oils/fats

Project Company
- Subsidies
- Own Capital
- Biodiesel
- Glycerine
- Fertilizer
- Investment Plant delivery

Products
- Business Plan
- Feasibility Study

Outside Capital Bank

Investment

Operator

Consultant

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Project Finance through export credit agency

Supplier
Biodiesel Plant

Bank
Of Plant Supplier

export credit agency

Client

Client’s Bank

Positive rating audited by ÖKB

Biodiesel Plant

Amount to be Invested

Loan Pay Back

Positive rating audited by ÖKB

Project Financing Contract

Guarantee

Project Financing Contract

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Business Plan – Contents I

• General project description
• Macroeconomic data
• Evaluation of market and competition
  – Sales potential on local and international market
  – Forecast marketing
• Technical feasibility
  – Technical specification of the Biodiesel plant
  – Product quality and fuel standards
  – Variants and sensitivity
    • Feedstock
    • Plant Capacity
• Socio-economic and environmental framework
  – Local added value and labour force potential
  – Synergies with other projects
  – Relations to EU directives and Kyoto Protocol
• Subsidies
  – Regional / national and international
• Phase plan

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Business Plan – Contents II

• Financial analysis
  – Pricing – country specific costs and cost estimates of the engineers
    • Investment costs (Plant, site & building, planning, duty & transport)
    • Operating costs (utilities, chemicals, energy, feedstock)
    • Working capital
    • Revenues
    • Personnel costs
    • Country specific taxes, outstanding accounts and accounts payable
  – Discounted Cash Flow Analysis (DCF) – IRR, NPV, PBP
  – Sensitivity Analysis
  – Break Even Sales Values
  – Net Income Statement
  – Projected Balance Sheet
  – Operating Costs
  – Costs per Litre Biodiesel
• Risk analysis
  – Commercial, political, technical risk, force majeur
• Legal and organisational aspects
• Project stakeholders

Competence – Markets – Speed
Best practice: Bus fleet in Graz

- Public Transport in Graz
  - 91.7 mio. passengers
  - 3.2 mio. km tram- and 8.5 mio. km bus-mileage
  - 70 trams und 134 buses
  - 7 tramlines und 25 buslines
  - linelength of tram network 51 km
  - linelength of bus network 186 km
  - funicular and lift
  - € 42.4 mio. turnover
  - ~750 employees
History

- 1994 pilot scheme
- 1997 10 buses more
- 2000 30% of the fleet
- 2003 83% biodiesel buses
- 2005 100% of the fleet
Technical requirements and results

- **Requirements**
  - exchange of fuel hoses and gaskets
  - check of all parts supplied with biodiesel (heaters)
  - certification from the engine manufacturer
  - consent from the producer of the injection pump

- **Results**
  - motor oil change every 30,000 km, no special motor oil is needed
  - no greater wear in the engine
  - 33% fossil diesel oil in winter
  - 7% higher consumption
  - biodiesel price is lower
  - scientific research
Prospects in Graz

- equip the fleet with particle katalysts or filters
- continue the way to lowest possible emissions
- support for other transport companies
- Further research
Prospects in CEEC - Drivers

• Global drivers
  – *the reduction of energy dependency on energy imports and thus, the increased security of supply*
  – *climate change mitigation and the CO₂ – trade make projects possible*
  – *long term perspectives, if residues are properly valorised and dedicated energy crops are grown*
  – *Biomass has the capacity to penetrate every energy sector: heating, power and transport. Bio-fuels can be stored easily and bioenergy produced when needed*
  – *Bioenergy creates worldwide business opportunities for EU industries*
  – *Biofuels are generally bio-degradable and non toxic, which is important when accidents occur.*
Prospects in CEEC - Drivers

• Specific drivers
  – Extensive potential in agriculture in CEEC due to efficiency measures
  – Long term experience in seed management
  – Development of new seed and agricultural methods and land use approaches within the EU FP6 and FP7
  – Favourable land ownership structures in new Member States in CEEC
  – Stable employment opportunities in rural areas and among small and medium sized enterprises; this in turn fosters regional development, achieving greater social and economic cohesion at community level
  – “BIOFUEL Marketplace” filling an important gap in the economic setup of the RES market

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Prospects in CEEC - Barriers

• Barriers
  – administrative and legislative bottlenecks, such as lack of legislation for tax exemption
  – Insecure markets due to lack of environmental consciousness in the public
  – costs of bio energy technologies and resources
  – competitiveness strongly depends on the amount of externalities included in the cost calculations
  – resource potentials and distributions
  – lack of organisation of biofuel supply chains
  – local land-use and environmental aspects in transition countries
## Yields in selected EU 25 (BTG 2004)

<table>
<thead>
<tr>
<th></th>
<th>Rapeseed Litres/ha</th>
<th>Rapeseed toe/ha</th>
<th>Sunflower Litres/ha</th>
<th>Sunflower toe/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1055</td>
<td>0.84</td>
<td>113</td>
<td>0.09</td>
</tr>
<tr>
<td>Belgium</td>
<td>1360</td>
<td>1.08</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Germany</td>
<td>1327</td>
<td>1.05</td>
<td>1116</td>
<td>0.88</td>
</tr>
<tr>
<td>Denmark</td>
<td>1193</td>
<td>0.94</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>France</td>
<td>1343</td>
<td>1.06</td>
<td>1041</td>
<td>0.82</td>
</tr>
<tr>
<td>Ireland</td>
<td>1287</td>
<td>1.02</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Italy</td>
<td>1023</td>
<td>0.81</td>
<td>1156</td>
<td>0.92</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>1298</td>
<td>1.03</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1188</td>
<td>0.94</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>1105</td>
<td>0.88</td>
<td>961</td>
<td>0.76</td>
</tr>
<tr>
<td>Hungary</td>
<td>n.a.</td>
<td>n.a</td>
<td>770</td>
<td>0.61</td>
</tr>
<tr>
<td>Poland</td>
<td>923</td>
<td>0.73</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Slovakia</td>
<td>607</td>
<td>0.48</td>
<td>777</td>
<td>0.62</td>
</tr>
</tbody>
</table>
### Average biodiesel production costs in the EU-25 (BTG 2004)

<table>
<thead>
<tr>
<th></th>
<th>Rapeseed based</th>
<th>Sunflower based</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>€/L</td>
<td>€/GJ</td>
</tr>
<tr>
<td><strong>Net feedstock cost</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Feedstock</td>
<td>0.570</td>
<td>16.8</td>
</tr>
<tr>
<td>- Co-product credit</td>
<td>0.011</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Subtotal feedstock cost</strong></td>
<td>0.559</td>
<td>16.4</td>
</tr>
<tr>
<td><strong>Conversion costs</strong></td>
<td>0.070</td>
<td>2.1</td>
</tr>
<tr>
<td>Blending costs (incl. adaptation of gasoline)</td>
<td>0.010</td>
<td>0.3</td>
</tr>
<tr>
<td>Distribution costs</td>
<td>0.100</td>
<td>2.9</td>
</tr>
<tr>
<td><strong>Total costs at petrol station</strong></td>
<td><strong>0.739</strong></td>
<td><strong>21.7</strong></td>
</tr>
</tbody>
</table>

**Competition – Markets – Speed**
Prospects on Biodiesel Price

- ECN study
  - Current production costs of RME app 0.50 €/litre (equivalent to 15 €/GJ or 360 €/toe)
  - Main cost factors are
    - Prices of feedstock used
    - Size and efficiency of the production plant
    - Oil yield
    - Value of by-products of the biodiesel production process (oil seed cake, glycerine)
  - Longer-term projections indicate a future decrease in RME production costs by more than 50%, up to approximately 0.20 €/litre (around 6 €/GJ or 250 €/toe).

- BTG study, 2004
  - Current costs at fuel station of app 0.74 €/litre (22 €/GJ or 930 €/toe), as shown in the table below. In this study, average prices of 233 €/t for rape seed and 258 €/t for sunflower seed were used.
## Potential bioethanol yields (wheat and sugar beet) in selected EU-25

<table>
<thead>
<tr>
<th></th>
<th>Common wheat</th>
<th>Sugar beet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Litres/ha</td>
<td>toe/ha</td>
</tr>
<tr>
<td>Austria</td>
<td>1,792</td>
<td>0.92</td>
</tr>
<tr>
<td>Belgium</td>
<td>2,847</td>
<td>1.46</td>
</tr>
<tr>
<td>Germany</td>
<td>2,620</td>
<td>1.34</td>
</tr>
<tr>
<td>Denmark</td>
<td>2,561</td>
<td>1.31</td>
</tr>
<tr>
<td>France</td>
<td>2,554</td>
<td>1.31</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>2,839</td>
<td>1.45</td>
</tr>
<tr>
<td>Sweden</td>
<td>2,069</td>
<td>1.06</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2,686</td>
<td>1.38</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>1,568</td>
<td>0.80</td>
</tr>
<tr>
<td>Hungary</td>
<td>1,365</td>
<td>0.70</td>
</tr>
<tr>
<td>Poland</td>
<td>1,215</td>
<td>0.62</td>
</tr>
<tr>
<td>Slovenia</td>
<td>1,330</td>
<td>0.68</td>
</tr>
<tr>
<td>Slovakia</td>
<td>1,360</td>
<td>0.70</td>
</tr>
</tbody>
</table>

**Competence – Markets – Speed**
## Bioethanol production costs in EU-25 + Bulgaria, Romania

<table>
<thead>
<tr>
<th></th>
<th>Wheat based</th>
<th>Beet based</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>€/L</td>
<td>€/GJ</td>
</tr>
<tr>
<td><strong>Net feedstock cost</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Feedstock</td>
<td>0.40</td>
<td>18.9</td>
</tr>
<tr>
<td>- Co-product credit</td>
<td>0.15</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Subtotal feedstock cost</strong></td>
<td>0.25</td>
<td>11.8</td>
</tr>
<tr>
<td>Conversion costs</td>
<td>0.28</td>
<td>13.3</td>
</tr>
<tr>
<td>Blending costs (incl. adaptation of gasoline)</td>
<td>0.05</td>
<td>2.4</td>
</tr>
<tr>
<td>Distribution costs</td>
<td>0.01</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Total costs at petrol station</strong></td>
<td>0.59</td>
<td>27.9</td>
</tr>
</tbody>
</table>
Fermentation of sugars to ethanol is a mature technology
- Applied commercially on a large scale
- Little chance of technological improvements that may significantly reduce the current production costs

Main cost factors
- Biomass feedstock prices (55 - 80% of the final price of ethanol)

ECN report:
- Present production costs for ethanol derived from sugar and starch crops are 20 €/GJ (corn, USA–0.42 €/L, or 834 €/toe) and 15-25 €/GJ (sugar beet, North West Europe)
- This is about 0.32-0.53 €/litre, or 625–1040 €/toe.

BTG, 2004 report:
- Assumptions: 140 EUR/t for wheat, 26.2 EUR/t for sugar beet
- Co-product credits for Dried Distillers Grains Soluble (DDGS) for wheat, beet sugar ethanol for sugar beet pulp.

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Summary

• Chances for CEEC
  – Structural funds to be used for development of regional biodiesel value chains
  – Better price-cost structures for biodiesel due to high potential in yield (oil content, yield per hectare, plant technology)
  – Better economy of scale due to land structures, therefore better price, therefore better competitiveness
  – Contributing to solving employment problem in rural regions
  – SUSTAINABLE PRICE ADVANTAGE ENTAILS CHANCE FOR EUROPEAN (GLOBAL ?) MARKET LEADERSHIP

Competence – Markets – Speed
BLUEWATERS – services for investors and Biodiesel producers

• Project finance consulting: screening of national and international finance institutions, preparation of required documents
• Market studies
• Research studies (baseline studies, PIN and PDD for JI/CDM projects)
• Networking, capacity building, Public awareness campaigns
• Feasibility Studies
• Business Plans / Bankable Documents

Competence – Markets – Speed
Thank you for your attention!

Competence – Markets – Speed